

**PART- II**  
**(3<sup>rd</sup> & 4<sup>th</sup> Sem.)**

**CURRICULUM OF DIPLOMA PROGRAMME ON**  
**MECHANICAL ENGINEERING (ME)**

**IN**

**MULTI POINT ENTRY & CREDIT SYSTEM**

**For the State of Nagaland**



*Path Finder for Excellence in Technical Education*

**National Institute of Technical Teachers' Training &  
Research, Kolkata**

**Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106**

<http://www.nittrkol.ac.in>



### Sample path for Mechanical Engineering

TERM - I

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	G101	Communication Skill-I		2	0	2	75	10	10	5	-	25	-	125	3
2	G103	Mathematics-I		3	1	0	75	10	10	5	-	-	-	100	4
3	G106	Physics – I		3	0	2	75	10	10	5	25	25	-	150	4
4	G108	Chemistry – I		2	0	2	75	10	10	5	25	25	-	150	3
5	G201	Engineering Drawing – I		1	0	4	-	-	-	-	25	25	-	50	3
6	G203	Workshop Practice - I		0	0	4	-	-	-	-	-	25	25	50	2
7	*G205A / G205B	Introduction to Information Technology /Computer Programming		2	0	4	50	0	0	0	25	50	-	125	4
<b>TOTAL</b>				13	1	18	350	40	40	20	100	175	25	750	23

\*G205A is for CSE, IT and CPE

TERM - II

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit	
			Pre-requisite	Contact Hours / Week			Theory			Practical						
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment				
								Class Test	Assignment	Attendance		Sessional	Viva-voce			
1	G102	Communication Skill-II	G101	2	0	2	75	10	10	5	-	25	-	125	3	
2	G104	Mathematics-II	G103	3	1	0	75	10	10	5	-	-	-	100	4	
3	G107	Physics – II	G106	3	0	2	75	10	10	5	25	25	-	150	4	
4	G109	Chemistry – II	G108	2	0	2	75	10	10	5	25	25	-	150	3	
5	G202	Engineering Drawing – I I	G201	1	0	4	-	-	-	-	25	25	-	50	3	
6	G204	Workshop Practice – II	G203	0	0	4	-	-	-	-	-	25	25	50	2	
7	G206A	Engineering Mechanics	G106 & G107	3	0	2	75	10	10	5	0	50	-	150	4	
	*G206B	C-Programming	G205B	2	0	4	50	0	0	0	50	50	-	150	4	
8	G301	Development of Life Skill-I		1	0	2	-	-	-	-	-	25	25	50	2	
9		Professional Practices – I#		0	0	2	-	-	-	-	-	50	-	50	1	
<b>TOTAL</b>					15/14	1	20/22	375/350	50	50	25/20	75/125	250	50	875	26

\*For CSE, IT and CPE

#Applied Technology course

**SAMPLE PATH: TERM - III**

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	G-105	Applied Mathematics	G103 & G104	3	1	0	75	10	10	5	-	-	-	100	4
2	G-207	Fundamentals of Electrical & Electronics	G106 & G107	3	0	2	75	10	10	5	25	25	-	150	4
3	G-302	Development of life Skill-II		1	0	2	-	-	-	-	-	25	25	50	2
4	ME401	Manufacturing Process-I		3	1	0	75	10	10	5	-	-	-	100	4
5	ME403	Strength of Materials	G206A	3	0	3	75	10	10	5	25	25	-	150	5
6	ME404	Mechanical Drawing	G201 G202	2	0	6	-	50	0	0	50	25	25	150	5
7	ME405	Thermal Engineering-I	G106 & G107	3	1	0	75	10	10	5	-	-	-	100	4
8	ME409	Workshop Practice –III		1	0	4	-	-	-	-	50	50	-	100	3
9	ME510	Professional Practice – II		0	0	2	-	-	-	-	-	50	-	50	1
<b>Total</b>				<b>19</b>	<b>3</b>	<b>19</b>	<b>375</b>	<b>100</b>	<b>50</b>	<b>25</b>	<b>150</b>	<b>200</b>	<b>50</b>	<b>950</b>	<b>32</b>

**SAMPLE PATH: TERM - IV**

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	G-303 to G-307	Soft Core Course-I		3	0	0	75	15	10	-	-	-	-	100	3
2	ME402	Manufacturing Process-II	ME401	3	1	0	75	15	5	5	-	-	-	100	4
3	ME407	Theory of Machines	G206A	3	1	0	75	15	5	5	-	-	-	100	4
4	ME410	Workshop Practice –IV		1	0	4	-	-	-	-	50	50	-	100	3
5	ME-504	Machine Tool Technology	ME401 &ME402	3	1	0	75	15	5	5	-	-	-	100	4
6	ME505	Thermal Engineering-II	ME405	3	0	3	75	15	5	5	25	50	-	175	5
7	ME406	Fluid Mechanics	G106 & G107	3	0	3	75	15	5	5	25	25	-	150	5
8	ME511	Professional Practice – III		0	0	2	-	-	-	-	-	50	-	50	1
<b>Total</b>				<b>19</b>	<b>3</b>	<b>12</b>	<b>450</b>	<b>90</b>	<b>35</b>		<b>100</b>	<b>175</b>	<b>-</b>	<b>875</b>	<b>29</b>

**SAMPLE PATH: TERM - V**

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva		
1	ME408	Hydraulic Machines	ME406	3	0	3	75	10	10	5	25	25	-	150	5
2	ME501	Metrology & Mechanical Measurements	G-106A & G-107	3	0	3	75	10	10	5	25	50	-	175	5
3	ME503	Machine Design	ME403	3	0	3	75	10	10	5	25	50	-	175	5
4	ME506	Mechatronics	G-207	3	0	3	75	10	10	5	25	50	-	175	5
5	ME507	Automobile Engineering	ME405 & ME505	3	0	3	75	10	10	5	25	50	-	175	5
6	ME512	Professional Practice – IV	ME409	-	-	2	-	-	-	-	-	50	-	50	1
<b>Total</b>				<b>15</b>	<b>5</b>	<b>17</b>	<b>375</b>	<b>50</b>	<b>50</b>	<b>25</b>	<b>125</b>	<b>275</b>	<b>-</b>	<b>1000</b>	<b>34</b>

**SAMPLE PATH: TERM - VI**

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva-voce		
1	G-303 to G-307	Soft core course-II		3	0	0	75	15	5	5	-	-	-	100	3
2	ME513	Professional Practice – V		-	-	4	-	-	-	-	-	50	-	50	2
3	ME502	Production Management		3	1	0	75	15	5	5	-	-	-	100	4
4	ME601to ME605	Elective-1		3	0	3	75	15	5	5	25	25	-	150	5
5	ME601to ME605	Elective-2		3	0	3	75	15	5	5	25	25	-	150	5
6	ME508	Project		-	-	10	-	-	-	-	-	50	50	100	5
<b>Total</b>				<b>13</b>	<b>3</b>	<b>10</b>	<b>300</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>650</b>	<b>24</b>
1	ME-09	<i>Industrial training</i>	-	-	-	-	-	-	-	-	100	100	-	200	10





# **TERM - III**

**COURSE TITLE : APPLIED MATHEMATICS**

L T P  
3 1 0

Curri Ref No: **G-105**

**Total Contact hrs: 60**

**Total marks: 100**

**Theory:**

Lecture: 45

End Term Exam: 75

Tutorial: 15

P.A: 25

Practical: 0

**Practical:**

**Pre-requisite: G-103, G-104**

End Term Exam: 0

**Credit: 4**

P.A: 0

**RATIONALE: -**

Mathematics is an important tool to solve wide variety of engineering problems. Most of the technological processes in industry are described effectively by using mathematical framework. Mathematics has played an important role in the development of mechanical, civil, aeronautical and chemical engineering through its contribution to mechanics of rigid bodies, hydrodynamics, aero-dynamics and heat transfer etc. It has become of great interest to electrical engineers through its application to information theory, design of digital computer etc.

**DETAIL COURSE CONTENT**

**THEORY:**

UNIT	TOPIC/SUB-TOPIC	LECTURE HRS
1.0	<b>Numerical Analysis</b> <b>1.1 Interpolation.</b> (i) introduction to interpolation. (ii) Lagrange's interpolation formula. (iii) The operators $\Delta$ , $\nabla$ and $\delta$ . Relation between them. (iv) Difference Table. (v) Newton's forward and backward interpolation formula. (vi) Concept of extrapolation.	<b>15</b>

	<p><b>1.2 Numerical Differentiation and Integration.</b></p> <p>(i) Newton's forward and backward difference formula</p> <p>for differentiation                      at any point</p> <p>at</p> <p><b>1.3 Numerical Integration.</b></p> <p>(i) Trapezoidal rule and Simpson's    rd rule.</p> <p><b>1.4 Numerical Solution of Ordinary Differential Equation</b></p> <p>(i) Introduction.</p> <p>(ii) Runge Kutta's 2<sup>nd</sup> and 4<sup>th</sup> order methods.</p>	
<p><b>3.0</b></p>	<p><b>Differential Equations (ordinary)</b></p> <p>(i) Introduction.</p> <p>(ii) Order and degree of a differential equation.</p> <p>(iii) Formation of Differential Equations.</p> <p>(iv) Solution of a Differential Equation.</p> <p>(v) Differential equation of the first order and first degree.</p> <p>(vi) Variables separable.</p> <p>(vii) Homogeneous Differential Equations.</p> <p>(viii) Linear Differential Equations.</p> <p>(ix) Equations reducible to linear form.</p> <p>(x) Exact differential Equations.</p> <p>(xi) Equations reducible to the exact form.</p> <p>(xii) Linear Differential Equations of second order with constant coefficients.</p> <p>(xiii) Complete solution = Complementary Function + Particular Integral.</p> <p>(xiv) Method of finding Particular Integral.</p> <p>(xv) Applications of differential equations to electrical circuit</p>	<p><b>15</b></p>

	<p>(xvi) problems.</p> <p>(xvii) Problems related to other physical systems.</p>	
<b>4.0</b>	<p><b>Graph Theory</b></p> <p>(i) Introduction.</p> <p>(ii) Basic Terminology.</p> <p>(iii) Simple Graph, Multigraph and Pseudo graph.</p> <p>(iv) Degree of a Vertex.</p> <p>(v) Types of Graphs.</p> <p>(vi) Subgraphs and Isomorphic Graphs.</p> <p>(vii) Operations of Graphs.</p> <p>(viii) Paths, Cycles and Connectivity.</p> <p>(ix) Eulerian and Hamiltonian Graph.</p> <p>(x) Shortest Path Problems using known Algorithm</p> <p>(xi) Representation of Graphs.</p> <p>(xii) Planar Graph.</p> <p>(xiii) Graph Colouring.</p>	<b>20</b>
<b>5.0</b>	<p><b>Discrete Mathematics</b></p> <p>5.1 The principle of Inclusion and Exclusion with examples.</p> <p>5.2 Generating Functions.</p> <p>(i) Introductory examples.</p> <p>(ii) Definition and examples of Calculation Techniques.</p> <p>(iii) Partition of integers with problems.</p> <p>(iv) Exponential Generating function with problems.</p> <p>5.3 Recurrence Relations.</p> <p>(i) First order linear recurrence relations</p> <p>(ii) Second order linear homogeneous recurrence relations with constant coefficients.</p> <p>(iii) Non-homogeneous recurrence relations.</p> <p>(iv) Method of generating functions</p> <p>(v) Problems on all the above topics..</p>	<b>10</b>

### **Reference Books.**

- (1) Integral Calculus by B.C.Das and B.N.Mukherjee.
- (2) Diploma Engineering Mathematics (Volume-II) by B.K.Pal.
- (3) Applied Mathematics-I by Dr.J.S.Bindra and K.S.Gill.
- (4) Applied Mathematics-II by Dr.J.S.Bindra and K.S.Gill.
- (5) Applied Mathematics-III by Dr.J.S.Bindra.
- (6) Engineering Mathematics (Volume-I, Volume-II & Volume-III)  
By S.Arumugam, A.Thangapandi Issac and A.Somsundaram.
- (7) Discrete and Combinatorial Mathematics by Ralph P.Grimaldi.
- (8) A TEXT BOOK OF DISCRETE MATHEMATICS by Swapan Kumar Sarkar.
- (9) Mathematics for Polytechnic by S.P.Deshpande.
- (10) Higher Engineering Mathematics by B.S.Grewal.
- (11) Introductory Method of Numerical Analysis by S.S.Sastry.
- (12) Calculus of Finite Difference and Numerical Analysis by Gupta-Malik.

<b>Name of the course : FUNDAMENTALS OF ELECTRICAL &amp; ELECTRONICS ENGINEERING</b>	
<b>Course code:</b>	<b>G207</b>
<b>Teaching Scheme</b>	<b>Maximum Marks : 150</b>
	<b>Progressive Assessment and End Examination Scheme</b>
Lecture : 3 hrs/week	Class test: 10 Marks
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance: 5 Marks
Practical : 2 hrs/week	End Semester Theory Exam: 75 Marks
Credit : 4	End Semester Practical Exam: 50 Marks
<b>Rationale :</b>	
<p>For a diploma holder in Electrical, Electronics, Communication and Computer Science engineering, it becomes imperative know the fundamentals of the electrical and electronics in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms, knowledge of fundamental concept of electricity, basic understanding of electronic components, their function and applications. This understanding should facilitate in operation and maintenance of equipment, which are used in various manufacturing processes in industries, power system operation, communication system, computer system etc</p>	
<b>Course Objective :-</b>	
<b>Module /Unit</b>	After completion of the course, students will be able to:
1.	Apply the fundamental concept on electrical and electronic components.
2.	Solve the simple problems on electrical and electronic circuits.
3.	Apply the appropriate techniques to solve problems using network theorems.
4	Explain the characteristic behaviors of various electronic components.

5	Explain the characteristics and applications of semiconductors, diodes and transistors.		
6	Explain operation and applications of logic gates.		
<b>Pre-Requisite :-</b>			
1.	Class X mathematics (Algebra, simultaneous equation etc.)		
2.	Class X Physics		
3.	Class X Chemistry		
<b>Contents (Theory)</b>		<b>Hrs.</b>	<b>Marks in %</b>
<b>MODULE 1</b>			
<b>UNIT - I</b>	<b>TECHNICAL TERMS AND DEFINITIONS WITH UNITS</b> 1.1 Electrical Current, Electrical pressure, Potential difference , Resistance 1.2 Factors affecting Resistance and temperature coefficient of resistance 1.3 Symbolic representation of sources, loads and basic protective devices 1.4 Conductors, Insulators and Semiconductors		



<b>UNIT - II</b>	<b>D. C. CIRCUITS</b> 2.1 Ohm's Law 2.2 Kirchhoff's current Law 2.3 Kirchhoff's voltage law 2.4 Analysis of series and parallel resistive circuits 2.5 Node voltage and loop current analysis 2.6 Power and Energy in such circuits. 2.7 Network Theorems-Thevenin's theorem 2.8 Norton's theorem 2.9 Maximum Power transfer theorem. 2.10 Superposition theorem. 2.11 Illustrated examples in DC circuits		
<b>UNIT- III</b>	<b>FUNDAMENTALS OF A.C. CIRCUITS</b> 3.1 Generation of sinusoidal AC voltage-2 hrs 3.2 Definition of average value, R.M.S. value, form factor and peak factor of sinusoidal voltage and current -2 hrs 3.3 Meaning of lagging and leading of sinusoidal wave -1 hr 3.4 Mathematical expression of sinusoidal voltage and current 3.5 Phasor representation of sinusoidal voltage and current 3.6 Definition of real power, reactive and apparent power-1 hr 3.7 Power Triangle and power factor. -1 hr 3.8 Analysis of R circuit with Phasor diagram -1 hr 3.9 Analysis of R-L circuit with Phasor diagram-1 hr 3.10 Analysis of R-C circuit with Phasor diagram 3.11 Analysis of R-L-C circuit with Phasor diagram		

	<p>3.12 Illustrative examples involving series and parallel circuits.</p> <p>3.13 Necessity and advantages of three phase system</p> <p>3.14 Balanced supply and load in three phase systems.</p>		
<b>MODULE II</b>			
UNIT-I	<p><b>1.1 SEMICONDUCTOR AND DIODES</b></p> <p>1.1.1 Introduction to Semiconductors, energy band theories.</p> <p>1.1.2 Intrinsic and Extrinsic semiconductors</p> <p>1.1.3 Potential barrier,</p> <p>1.1.4 PN junction diode</p> <p>1.1.5 Zener diode</p> <p>1.1.6 V-I Characteristics of PN junction diode and Zener diode.</p> <p>1.1.7 Introduction to LED, Varactor, Tunnel diode, Photo diode</p> <p><b>1.2 DIODE CIRCUIT APPLICATIONS</b></p> <p>1.2.1 Diode as rectifying element</p> <p>1.2.2 Operation of rectifiers: half and full wave rectifier.</p> <p>1.2.3 Rectifier with filter circuits</p> <p>1.2.4 Circuit applications of diode as clippers, clampers.</p> <p>1.2.5 Zener voltage regulator circuits</p> <p>1.2.6 Illustrated examples of diode circuits</p>		

<p><b>UNIT-II</b></p>	<p><b>2.1 BIPOLAR JUNCTION TRANSISTOR</b></p> <p>2.1.1 Introduction to Transistor</p> <p>2.1.2 V - I characteristics of transistor</p> <p>2.1.3 Transistor in active ,saturation and cut –off region</p> <p>2.1.4 Transistor as amplifier</p> <p><b>2.2 FIELD EFFECT TRANSISTOR</b></p> <p>2.2.1 Introduction to FET</p> <p>2.2.2 Construction of JFET</p> <p>2.2.3 Mechanism of operation of a JFET</p> <p>2.2.4 Characteristics of JFET</p> <p>2.2.5 Compare JFETs and BJTs</p> <p>2.2.6 Introduction to OP-AMP</p>		
<p><b>UNIT-III</b></p>	<p><b>3.1 NUMBER SYSTEM AND LOGIC GATES</b></p> <p>3.1.1 Introduction to digital system -0.5 hr</p> <p>3.1.2 Difference between digital and analog signals</p> <p>3.1.3 Number system-1hr</p> <p>5.6 Binary -0.5 hr</p> <p>3.1.4 Binary, Octal, Hexadecimal -0.5 hr</p> <p>3.1.5 Binary coded decimal -0.5 hr</p> <p>3.1.6 1’s and 2’s complement arithmetic-1 hr</p> <p>3.1.7 Gray codes and excess 3 codes -1 hr</p> <p>3.1.8 ASCII code -1 hr</p> <p>3.1.9 Weighted codes-1 hr</p> <p>3.1.10 Logic gates- OR, AND, NOT, NOR, NAND, XOR</p> <p>3.1.11 Universal logic gates</p> <p>3.1.12 Illustrated examples related to Number system and logic gates.</p>		

	<p><b>3.2 BOOLEAN ALGEBRA</b></p> <p>3.2.1 Boolean variables</p> <p>3.2.2 Boolean functions</p> <p>3.2.3 Rules and laws of Boolean algebra</p> <p>3.2.4 De Morgan's theorem</p> <p>3.2.5 Algebraic reduction of Boolean expressions</p> <p>3.2.6 Realization of Boolean expression with logic circuit</p> <p>3.2.7 Karnaugh Map techniques</p>		
<b>Total</b>			
<p><b>Practical:</b></p> <p>LIST OF EXPERIMENTS:</p> <ol style="list-style-type: none"> <li>1. <span style="float: right;">To Identify of Passive circuit Components</span></li> <li>2. To perform the good bad test of Passive Components</li> <li>3. To verify Kirchoff's Current Law and Voltage Law</li> <li>4. To develop the charging and discharging curve of voltage across the capacitor connected in series with a resistor</li> <li>5. To measure the voltages across R, L, C and study the phasor diagram</li> <li>6. To study the characteristics of series RLC circuit and to develop phasor diagram</li> <li>7. To determine the forward and reverse characteristics of PN junction diode</li> <li>8. To determine the input and output characteristics of Junction transistor</li> <li>9. To Verify of Truth Tables for AND, OR, NOT, Exclusive-OR gates</li> <li>10. To develop exclusive-OR gate using basic building block</li> </ol>			
	<b>Skills to be developed</b>		
1.	<p><b>Intellectual skills-</b></p> <p>Understanding working of electrical and electronics fundamentals. interpretation and analysis of electrical and electronic circuits, understanding working principles and application of semiconductors, PN junction diodes, rectifiers voltage regulators and transistors.</p>		

2.	<b>Motor skills-</b> <ul style="list-style-type: none"> <li>• Draw circuit diagram,</li> <li>• Construct circuits to verify fundamental laws and theorems of electrical circuits,</li> <li>• Test components using appropriate instruments,</li> <li>• Follow standard procedure to test charging and discharging of capacitor, V-I characteristics of diodes, rectifiers, voltage regulators, Transistor as a switch and amplifier.</li> <li>• Troubleshooting simple electrical circuits and repairing</li> <li>• Design voltage regulated power supply</li> <li>• Troubleshooting of basic electronic circuit and repairing</li> </ul>
3	<b>Social skills-</b> Learn to work with peers as a group Communicate with peers and teachers to clarify the doubts Arrange the workplace

**Text /Reference Books:**

Name of Authors	Titles of the Book	Edition	Name of the Publisher
B L Theraja	Text Book of Electrical Technology, Vol-I		S Chand
P S Dhogal and S K Mondal	Basic Electrical Engineering- Vol-I		Tata McGraw Hill
V K Mehta	Principles of Electrical and Electronics Engineering		S Chand
J B Gupta	Basic Electronics		S K Kataria and Sons
S K Mondal	Basic Electronics		Tata McGraw Hill
A P Malvino	Principles of Electronics		Tata McGraw Hill
Digital Electronics Principles and Applications	S. K. Mandal,	.	Mc Graw Hill Education.

## Development of Life Skill -II

**L**        **T**        **P**  
**1**        **0**        **2**

Curri. Ref. No.: G 302

**Total Contact hrs : 45**

**Total marks: 50**

**Theory: 15**

**Practical:**

**Tutorial: 0**

**End Term Exam: 25**

**Practical: 30**

**P.A : 25**

**Credit : 2**

UNITS	Contents	Hours
Units1	<p><b>Inter personal Relation</b></p> <p>Importance, Interpersonal conflicts, Resolution of conflicts, Developing effective interpersonal skills communication and conversational skills, Human Relation Skills (People Skills)</p>	
Unit 2	<p><b>Problem Solving</b></p> <p><b>I) Steps in Problem Solving (Who? What? Where? When? Why? How? How much?)</b></p> <ol style="list-style-type: none"> <li>1. Identify, understand and clarify the problem</li> <li>2. Information gathering related to problem</li> <li>3. Evaluate the evidence</li> <li>4. Consider feasible options and their implications</li> <li>5. Choose and implement the best alternative</li> <li>6. Review</li> </ol> <p><b>II) Problem Solving Technique</b></p> <ol style="list-style-type: none"> <li>1. Trial and Error,</li> <li>2. Brain Storming</li> <li>3. Thinking outside the Box</li> </ol>	
Unit 3	<p><b>Presentation Skills</b></p> <p>Concept, Purpose of effective presentations,</p> <p><b>Components of Effective Presentations:</b></p> <p>Understanding the topic, selecting the right information, organizing the process interestingly, Good attractive beginning, Summarising and concluding, adding</p>	

	<p>impact to the ending,</p> <p><b>Use of audio visual aids</b> OHP, LCD projector, White board,</p> <p><b>Non verbal communication:</b>  Posture, Gestures ,Eye contact and facial expression,  Voice and Language Volume, pitch, Inflection, Speed, Pause,  Pronunciation,  Articulation, Language  Handling questions Respond, Answer, Check, Encourage, Return to presentation</p> <p><b>Evaluating the presentation</b> : Before the presentation, During the presentation,  After the presentation</p>	
Unit 4	<p><b>Looking for a Job</b></p> <p>Identifying different sources announcing Job vacancies, Skim, scan and read advertisements in detail, write efficacious CVs, write covering letters to a company CVs, write Job Application Letters in response to advertisements and self-applications</p>	5
Unit 5	<p><b>Job Interviews</b></p> <p><i>Prepare for Interviews:</i>  Intelligently anticipating possible questions and framing appropriate answers, Do's and don'ts of an interview(both verbal and non verbal),</p> <p><b>Group Discussion:</b>  Use of Non verbal behavior in Group Discussion,  Appropriate use of language in group interaction,  Do's and don'ts for a successful Group Discussion</p>	10
Unit 6.	<p><b>Non verbal graphic communication</b></p> <p>Nonverbal codes:</p> <ul style="list-style-type: none"> <li>A. Kinesics</li> <li>B. Proxemics</li> <li>C. Haptics</li> <li>D. Vocalics</li> <li>E. Physical appearance</li> <li>F. Chronemics</li> <li>G. Artifacts Aspects of Body Language</li> </ul>	6

Unit 7.	<b>Formal Written Skills:</b> Memos, Emails, Netiquettes, Business correspondence Letter of enquiry, Letter of Placing Orders, Letter of Complaint	6
	<b>Total</b>	<b>48</b>

	<b>Sessional Activities</b>	
Unit I. Interpersonal Relation	<b>Case Studies:</b> 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies	
Unit II Problem Solving	<b>Case Studies:</b> 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies	
Unit III Presentation Skills	Prepare a Presentation (with the help of a Power point) on a Particular topic. The students may refer to the Sessional activity (sl.No.8) of the Computer Fundamental syllabus of Semester1. For engineering subject oriented technical topics the cooperation of a subject teacher may be sought. Attach handout of PPT in the sessional copy	
Unit IV Looking for a job	Write an effective CV and covering letter for it. Write a Job Application letter in response to an advertisement and a Self Application Letter for a job.	
Unit V Job Interviews & Group Discussions	Writedown the anticipated possible questions for personal interview (HR) along with their appropriate responses Facemock interviews. The co-operation of HR personnels of industries may be sought if possible Videos of Mock Group Discussions and Interviews may be shown	
Unit 7	Write a memo,	



Formal Written Skills	Write an effective official e-mail, write a letter of enquiry, letter of placing orders, letter of complaint	
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**COURSE TITLE : MANUFACTURING PROCESS-1**

**L T P**  
**3 1 0**

**Curri Ref no: ME 401**

**Total Contact hrs.:60**

Lecture: 45

Tutorial: 15

Practical: 0

**Total marks:100**

**Theory**

End Term: 75

P.A: 25

**Practical:**

End Term: 00

P.A: 00

**Pre-requisite:**

**Credit :4**

**RATIONALE:**

Manufacturing is the basic area for any mechanical engineering technician. The technician should be introduced to the basic processes of manufacturing. This subject will help the student to be familiarized with working principles and operations like forging, rolling, extrusion, press working, lathe, drilling, milling, casting, welding, brazing and soldering etc. The basic knowledge of these processes will be helpful to select the most appropriate process for getting the desired results in terms of getting the raw material converted to finished product as per the requirements.

**DETAILED COURSE CONTENTS**

**THEORY**

<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
<b>Chapter – 1.0 Introduction</b>	<b>5</b>
1.1. Manufacturing processes	
1.2. Factors influencing selection of Manufacturing processes	
1.3. Mechanical properties of metals and alloys	
1.4. Carbon steels and alloy steels: composition and properties.	
<b>Chapter-2.0 Forging</b>	<b>10</b>
2.1. Forging Processes – Drop forging, Upset forging, Die forging or press forging.	
2.2. Types of dies - Open Die, Closed Die(Single Impression and Multi-impession).	
2.3. Forging operations - Fullering, Edging, Bending, Blocking, Finishing	
2.4. Forgeable material and forgeability, Forging temperature, Grain flow in forged parts	

2.5. Types of Presses and hammers.

**Chapter-3.0 Rolling**

**10**

3.1. Principles of rolling

3.2. Hot and cold rolling.

3.3. Types of rolling mills.

3.4. Different sections of rolled parts.

**Chapter 4.0. Extrusion**

**9**

4.1. Principles of Extrusion

4.2. Methods of extrusion – Direct, Indirect, backward & impact Extrusion, Hot extrusion, Cold extrusion

4.3. Advantages, disadvantages and applications.

**Chapter-5.0 Press working**

**12**

5.1. Types of presses and Specifications.

5.2. Press working operations - Cutting, bending, drawing, punching, blanking, notching, lancing

5.3. Die set components.- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot.

5.4. Punch and die Clearances for blanking and piercing, effect of clearance.

**Chapter-6.0 Casting**

**14**

6.1. Patterns - Material used, types, Patterns allowances, Cores, Core allowances.

6.2. Moulds - Mould materials, Types of sand, Moulding processes Sand molding, Pit molding, machine molding. Shell molding.

6.3. Melting practice. Types of furnaces with specific application Cupola furnace, Electric arc furnace.

6.4. Casting principle and operation

6.5. Special casting processes. viz die casting, centrifugal casting, Investment casting.

6.6. Casting defects

**Suggested Learning Resources**

**(a) Reference Books**

<b>S. No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
1	Elements of workshop Technology – Volume I & II	<b>S.K. Hajra Chaudary, Bose, Roy Media Promoter &amp; Publisher Ltd</b>

2	Processes and design for manufacturing Technology – Volume-I & II	<b>D.L. Wakya Prentice Hall</b>
3	Production Technology Volume I & II	<b>O.P. Khanna &amp; Lal Prentice Hall</b>
4	Workshop Technology Volume I & II	<b>W.S.J. Chapman Prentice Hall</b>
5	Introduction to Manufacturing Process	<b>Jhon A Schey, McGraw Hills International</b>
6	Manufacturing Technology	<b>M. Aduthan and A. B. Gupta, New Age International</b>
7	Manufacturing Technology, Foundry, forming and Welding	<b>P.N.Rao, Tata McGraw Hill Publishing company ltd</b>
8	Manufacturing Engineering & Technology	<b>Serope Kalpak jian, Addison Wesley Publishing company</b>



## COURSE TITLE : STRENGTH OF MATERIALS

L            T            P  
3            0            3

Curri Ref no: ME 403

- **Total Contact hrs.:90**            **Total marks:150**
- Lecture: 45
- Tutorial: 0
- Practical: 45
  
- **Pre-requisite: G- 206A**
- **Credit :5**

**Theory**  
End Term: 75  
P.A: 25  
**Practical:**  
End Term: 25  
P.A: 25

### Rationale :

Machine parts are subjected to various types of loads resulting in development of stresses and strains. If, these stresses and strains are allowed to develop beyond the safe limit, the concerned part may fail. As a technician, it becomes very essential to understand the effects of loads on any part. Due to competition, there is demand to reduce the size of the parts, which again increases the stresses on the parts. And, yet we have to assure the reliability and durability of the concerned parts. All these factors are focussing the attention of the technicians and engineers for need based designs by studying the effects of loads, stresses and strains in the parts and find necessary solutions. This subject deals with the effect of various forces on different materials.

### DETAILED COURSE CONTENTS THEORY

UNIT TOPIC/ SUB-TOPIC	Lecture HRS
<b><i>Chapter-1.0 Introduction of Material Properties</i></b>	<b>2</b>
1.1 <i>Definition of elasticity, plasticity, brittleness, ductility, fatigues, malleability, hardness, toughness, elastic bodies, plastic bodies, deformations.</i>	
1.2 Force : Definitions, types.	
<b><i>Chapter.2.0 Simple Stress &amp; Strain</i></b>	<b>9</b>
2.1 Definition of stress & strain , Axial loading.	
2.2 Tensile & compressive stress & Strain, elastic limit, Hooke's law. Stress-	

strain Curve for ductile & brittle material. Salient Features on stress & strain curve.	
2.3 Factor of safety, safe stresses.	
2.4 Stress & strain on composite section under axial Loading. Stress & strain due to temperature variations in Homogeneous & composite bars.	
2.5 Shear load, shear stress & strain, modulus of Rigidity. Lateral strain. Poisson's ratio, Bi-axial & Tri-axial stress.	
2.6 Volumetric strain, Bulk modulus. Relation between modules of elasticity, bulk Modulus & modulus of rigidity.	
<b>Chapter-3.0. Principle Strain &amp; Stress.</b>	<b>5</b>
3.1 Different states of stresses,	
3.2 Normal & Tangential stress on oblique planes, resultants stress.	
3.3 Principle stresses & principle planes.	
<b>Chapter-4.0 Strain Energy</b>	<b>5</b>
4.1 Definitions & concept of strain energy,	
4.2 Proof resilience & modulus of resilience.	
4.3 Stresses developed due to gradual, sudden & impact of falling load (Derivations are not required)	
4.4 Strain energy stored due to gradual, sudden & impact load.	
<b>Chapter-5.0 Shear Force &amp; Bending Moment</b>	<b>9</b>
5.1 types of beams & types of support.	
5.2 Concept of shear force & bending moment, sign conventions.	
5.3 Shear force & bending moment diagram for cantilever & simply supported beam subjected to point & uniformly distributed load only.	
<b>Chapter-6.0 Moment of Inertia</b>	<b>3</b>
6.1 Definition of M.I., M.I. of different plane Lamina, radius of gyration, perpendicular & Parallel axis theorem.	
6.2 M.I. of rectangular, circular, semi-circular. Triangular, hollow rectangular, symmetrical I-section, channel section, Tee-section, angle section about <b>centroidal axis.</b>	
<b>Chapter-7.0 Torsion</b>	<b>4</b>
7.1 Concept of pure torsion, moment of resistance,	
7.2 Torsion equation, assumptions in theory of pure torsion,	

- 7.3 Strength of circular solid and hollow shaft in pure torsion.
- 7.4 Sheer stress distribution ,
- 7.5 Polar modulus, Power transmitted by shaft, stresses in bolts and keys of shaft couplings, closed coiled helical springs.

**Chapter-8.0 Thin Cylinder** **3**

- 8.1 Definition of thin & thick cylinder.
- 8.2 Hoop stress, longitudinal stress & stress in the wall of the thin Cylinder due to internal pressures. Change in dimension & change in volume due to internal pressures.

**Chapter 9.0 Columns and struts:** **3**

- 9.1. Definition of columns and struts, buckling (critical) load, slenderness ratio, classification of columns.
- 9.2. Euler’s theory: Basic assumption, effective length for different endscondition.

**Chapter 10.0 Slope and deflection of beams:** **3**

- 10.1. Slope and nature of elastic curve

**Suggested Learning Resources**

**(a) Reference Books**

Sr.no	Title	Author	Publisher
1	Strength of Materials	Ramanathan	Dhanpat Rai & sons .
2	Strength of Materials	F.L.Singer	London Harper & row
3	Strength of Materials	Schaum Series	Tata McGraw hill
4	Strength of material	R.S. Khurmi	S. Chand & Co ltd
5	Strength of Material	R.K. Rajput	S. Chand & Co Ltd

**a) List of Experiments** **(45 Hrs)**



- Demonstration of Experiments on Universal testing machine (UTM)
- Demonstrate elastic limit, yield point etc. using tensometer.
- Tensile test on mild steel & cast iron using UTM.
- Single shear & double shear test on mild steel bars using UTM.
- Hardness test on metals. (Brinells, Rockwell test)
- Izode impact test on M.S., Aluminium , Brass
- Charpy impact test on M.S., Aluminium , Brass
- Flexural test on mild steel
- Single & Double shear test on Aluminium



## COURSE TITLE : MECHANICAL DRAWING

**L**      **T**      **P**  
**2**      **0**      **6**

**Curri Ref no: ME 404**

• **Total Contact hrs.:120**

**Total marks:150**

**Theory**

• Lecture: 30

P.A: 50

• Tutorial: 0

**Practical:**

• Practical: 90

End Term: 50

P.A: 50

• **Pre-requisite: G- 201,G202**

• **Credit :5**

### **RATIONAL :**

Technicians have to work in different situations like supervision of production of Mechanical components, maintenance of machines, procurement of components and equipment, etc. In whatever capacities he/she may be working, as a technician, one has to prepare, read and interpret drawing of Mechanical components. They may have to

- Prepare estimates of material requirements from the drawings of objects,
- Explain production drawing to the operator on the machine to carry out different operations,
- Inspect and compare with the drawing the different dimensions of the prepared work pieces,
- Interpret the relationships of different parts in an assembly unit etc.

All these activities require sketching and drawing of objects and assemblies., as well as interpreting the drawings. Thus, drawing is a graphical language of an engineer, and this subject of machine drawing will help to achieve the required abilities of preparing and interpreting the drawings of objects.

### **DETAILED COURSE CONTENTS THEORY**

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<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
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**Chapter. 1.0 Curves of interpenetration**

**4**

1.1 Curves of interpenetration of the surfaces of solids in the following cases

a) Cylinder with cylinder when

- Axes are at 90 and intersecting
- Axes are at 90 and offset.

b) Cylinder with cone when

- Axes if Cylinder is parallel to HP and VP and perpendicular and intersecting the axis of cone.

- Axis of cone and cylinder are vertical parallel and co-axial.

**Chapter 2.0 Details and assembly of machine parts**

**9**

2.1 (Components may be selected from the following)

S.U. Carburettor, clapper box, gas regulator, gas lighter, assembly, punching machine, combination player, ball pen, mechanism, assembly, arbour Oldham and universal coupling simple bushed ball, roller and foot step bearing. Fast loose stepped and V belt pulley, tool post and tailstock.

**b)**

**Chapter 3.0 Production Drawing**

**9**

3.1 Allowances and tolerances, geometric tolerances.

3.2 Selection of tolerances

3.3 Study of limits and fits, types of fits, selection of fits

3.4 Surface finish, symbols, and machining processes symbols.

3.5 Basic size, actual size, design size.

3.6 Method of placing limit dimensions ( showing tolerances on individual dimensions).

3.7 Production drawing( components may be selected from the list given below.)

c) hexagonal nut,

d) hexagonal headed bolt

e) spur gear

f) lathe spindle

g) shaft with keyway

h) v-belt pulley

i) fly wheel

3.8 Use of I.S. data book (sp 46-1988)

**Chapter 4.0 Conventional Representation**

**4**

4.1 Welded joints.

Representation of weld and preparation of working drawing showing the sizes of weld lengths, flush, finish with supplementary symbols etc.

- 4.2 Drawing notations .
- Long and short breaks and pipes, rods, shafts.
  - Materials CI, MS, Brass, Bronze, Aluminium, Rubber
  - Ball and roller bearings
  - Cocks and valves
  - Half, removed, revolved, offset, partial, local, broken sections.
- 4.3 Pipe joints
- Pipe fittings as nipple, coupling, reducer, elbow, plug, bend, cross, Flanged, joint, unions.
  - Pipe line lay out
  - Socket and spigot joint as per I.S. Code.

**Chapter 5.0 Free hand Sketches**

**4**

(Industrial drawing are to be used for reading & sketching)

- 5.1 Different types of threads and thread profiles bolts nuts etc.
- 5.2 Keys -sunk key, saddle key, taper key, woodruff key, and cone key.
- 5.3 Coupling - flange, muff, flexible, Oldham
- 5.4 Joints -Cotter, knuckle.
- 5.5 Pulleys -flat belt, v-belt, fast and loose
- 5.6 I.C.Engine connecting rod, gland and stuffing box
- 5.7 Steam stop valves and non-return valve.
- 5.8 Journal bearing, pedestal bearing, Plummer block bearing and foot step bearing.

Note : Some of the sketches can be drawn during the practical hours.

**Suggested Learning Resources**

**(a) Reference Books**

S. No.	Title	Author	Publisher
1	Elements of Machine Drawing	N.D.Bhatt,	Anand Charotkar
2	Machine Drawing	Siddheswar,	TMH
3	Machine Drawing	K. L. Narayana, P. Kannaya,	New age International (P) Ltd New Delhi
4	Machine Drawing	Nagpal,	Khanna Publisher

5	Machine Drawing	R.K.Dhawan,	S.Chand.
6	Production Drawing	K.L. Narayana, P. Kannaiah, K. Venkata Reddy,	New Age International (P) Ltd, New Delhi
7	A text book on Machine drawing	R.B. Gupta,	Satya Prakashan New Delhi

**COURSE TITLE : THERMAL ENGINEERING-1**

L T P  
3 1 0

Curri Ref no: ME 405

• **Total Contact hrs.:**60

**Total marks:**100

**Theory**

• Lecture: 45

End Term: 75

• Tutorial: 15

P.A: 25

• Practical: 0

**Practical:**

▪ End Term: 00

P.A: 00

• **Pre-requisite:**G-106,G107

• **Credit :**4

**RATIONALE :**

Mechanical engineers have to work with various power producing, power absorbing and heat transfer devices. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them . Hence it is important to study the subject of Thermodynamics. It includes the study of various sources of energy, basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application.

Boilers find application in different process industries. Steam turbines and condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices.

**DETAILED COURSE CONTENTS  
THEORY**

UNIT TOPIC/ SUB-TOPIC	Lecture HRS
<b>Chapter 1.0 Sources of energy</b>	<b>6</b>
1.1 Brief description of energy sources	
- Classification of energy sources	
- Renewable, Non-Renewable	

- 1.2 Fossil fuels, including CNG, LPG.
- 1.3 Solar
  - Flat plate and concentrating collectors& its application.
  - Solar Water Heater
  - Photovoltaic Cell, Solar Distillation.
- 1.4 Winds, Tidal, Geothermal
- 1.5 Biogas, Biomass, Bio-diesel
- 1.6 Hydraulic, Nuclear

**Chapter-2.0 Fundamentals of Thermodynamics 15**

- 2.1 Concepts of pure substance, types of systems, properties of systems, Extensive and Intensive properties with units and conversion like P, V,  $\rho$  And temperature. Point function and path function.
- 2.2 Work and Energy
  - Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy.
- 2.3 Laws of Thermodynamic
  - Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2.
- 2.4 Application of Thermodynamic laws
  - Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser.

**Chapter- 3.0 Ideal Gases 12**

- 3.1 Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant.
- 3.2 Ideal gas processes: -
  - Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic, Isentropic with representation of the processes on P-V and T-S diagram

**Chapter- 4.0 Steam and Steam Boiler 10**

- 4.1 Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical).
- 4.2 Vapour process : -
  - constant pressure, constant volume, constant enthalpy, constant entropy (numericals using steam table and Mollier chart), Rankine Cycle
- 4.3 Steam Boilers: -



	- Classification of boilers.	
	- Construction and working of	
	- Cochran, Babcock and Wilcox, Lamont and Loeffler boiler.	
	Boiler draught natural and Mechanical.	
4.4	Boiler mounting and accessories	
<b>Chapter-5.0</b>	<b>Steam Turbines and Condensers</b>	<b>10</b>
5.1	Steam nozzle: -	
	- Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.	
5.2	Steam turbine: -	
	- Classification of turbines, Construction and working of Impulse and Reaction turbine.	
5.3	Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing (no velocity diagrams and numerical).	
5.4	Steam condenser: -	
	- Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers.	
5.5	Concept of condenser efficiency, vacuum efficiency (numerical)	
<b>Chapter-6.0</b>	<b>Heat Transfer</b>	<b>7</b>
6.1	Modes of heat transfer: -	
	- Conduction, convection and radiation.	
6.2	Conduction by heat transfer	
	- Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection	
6.3	Heat transfer by Radiation: -	
	- Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman law.	
6.4	Heat Exchangers: -	
	- Shell and tube, plate type, multiphase heat exchangers. Materials Used and applications of heat exchangers.	

### Suggested Learning Resources

#### (a) Reference Books

S.No.	Name of book .	Author	Publication
1	Thermal Engineering	Domkundwar	S.Chand
2.	Thermal Engineering	Ballaney	Dhanpatrai
3.	Engg. Thermodynamics	P.K.Nag	Tata Macgraw Hill
4.	Thermal Engineering.	B.K. Sarkar	Tata Macgraw Hill



**COURSE TITLE : WORKSHOP PRACTICE - III**

L	T	P	Curri. Ref. No: ME 409
1	0	4	
Total Contact hrs.: 75	Total marks: 100	Theory:	
Lecturer: 15		End Term Exam: 0	
Tutorial : 0		Practical:	
Practical: 60		End Term Exam: 50	
Pre requisite:		P.A:50	
Credit: 3			

**RATIONALE :**

The wealth of a community is measured by the variety and quality of the articles it possesses for its use and consumption. All the materials we possess are made from substances won from the earth, or from nature. Our property depends upon our ability to convert these raw materials into useful articles for consumption, and to distribute these articles equitably amongst the various members of our community. The production of our engineering workshops is important since a large proportion of our industries is of an engineering nature. Our ability, therefore, to maintain a high standard of skill in our engineering workshops is an important factor.

**Aim**

To use and describe the tools, materials and working principles of various processes for pattern making shops, foundry shops, and electric shops.

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<b>UNIT</b>	<b>TOPIC/SUB-TOPIC</b>	<b>Contact Hrs.</b>
<b>1.0</b>	<b>PATTERN MAKING SHOP</b>	<b>5</b>
	1.1. Shop Talk	
	1.1.1 Introduction to pattern making, Role of pattern making and its importance.	

- 1.1.2 Use and description of different pattern making tools: Planning tools, Block Plane, Rabbet Plane, Router Plane, Circular Plane, Plough Plane, Core box, Draw knife etc.  
Sawing tool, Coping saw, Bow saw, Mitre box, Marking and layout tools, Contraction scale of shrinkage rule, Dividers, calipers, Miscellaneous requirements, Pinch dogs, files and other tools.
- 1.1.3 Pattern making materials and factors effecting in selection of pattern materials. Wood: types and desirable properties, Plaster: types and desirable properties, Plastic: types and desirable properties, Wax.
- 1.1.4 Types of patterns Solid or single piece pattern, two piece or split pattern, multiple pattern, match plate pattern, gated pattern, skeleton pattern, sweep pattern, cope and drag pattern
- 1.1.5 Types of core boxes Half core box, dump core box, split core box, right and left hand core box.
- 1.1.6 Design consideration in pattern: Allowance, selection of parties & line, material, Selection, desirable surface finish.
- 1.1.7 Pattern making allowance Shrinkage allowance, machining allowance, draft allowance, allowance, Distortion allowance
- 1.1.8 Colour coating for pattern and core boxes: Representation of different types of surfaces by different colours.

1.2. Patten Shop Practice	18
1.2.1 Marking of solid pattern of simple machine parts	
1.2.2 Marking of a pattern using fillet core prints and flange	
1.2.3 Marking of a pattern on wood turning lathe machine	

1.3 Test and Viva – Voce.	2
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**2.0 FOUNDRY**

2.1 Shop talk	5
2.1.1 Introduction to foundry and it's importance	

2.1.2 Tools and equipment: Hand tools, containers, mechanical tools, sand testing and conditioning tools, metal melting equipment, fettling and finishing equipment. Hand tools: Shovel, Hand riddle, Rammers, Strike off bar, Vent ware, Trowels, slicks, liffers or cleaners, Draw spike, Mallet. Containers : Moulding boxes or flasks, ladles, crucibles

2.1.3 Moulding materials and moulding process: Types of mould materials and factors influencing, their selection, Metals, Non – metals. Types of moulding sands Natural sands, Selica sands. Characteristics of moulding sand Rafractoriness, Permeability, Flowability, Adhesiveness, and cohesiveness, Collapsibility. Terminology of foundry sands:Green sand, dry sand, facing sand, parting sand, floor, black or baking sand. Types of moulding machines:Jar or jolt machines, squeezer machine, jolt-squeezer machine, diaphragm moulding machine. Functions of Runner, riser, cleaner and vent wire.

2.1.4 Furnaces used in foundry:Pit furnace, Tilting furnace, Cupola, lower, Burner.

2.1.5 Charging a furnace, melting and pouring both ferrous and non-ferrous metals.

2.1.6 Dry repairing and finish of a mould

2.1.7 Cleaning of casting.

2.2 Foundry shop Practice **18**

2.2.1 Preparation of moulding sand, Practice on Green Sand Moulding with simple solid pattern with one box., Practice on Green Sand Moulding with drag and cope by skin dry method, Preparation of core sand and making a simple core.

2.2.2 Practice on core fitted moulds like flanges, brackets pulleys etc

2.2.3 Preparing a mould with a pattern made in the pattern shop.

2.2.4 Casting of the model as prepared from the pattern shop.

2.3 Test and Viva-Voce **2**

### **3.0 ELECTRIC SHOP**

3.1 Shop Talk **5**

3.1.1 Introduction to Electric shop

3.1.2	Knowledge about safety precautions: Rules for protection against electric shock, What to do for a victim of electric shock, Fire extinguisher	^^
3.1.3	Common conductors and insulators used for electrical engineering practice.	
3.1.4	Common measuring instruments and methods: Safety, accuracy, meters, multi-meters, digital meters etc.	
3.1.5	Various types of electrical fittings used for domestic wiring: Surface and conceal, Knowledge about wiring regulation, Wiring of terminals and plugs.	
3.1.6	Study of Three Phase Induction Motor: Reversing of direction for single and three phase Motors and starters.	
3.1.7	Earthing materials and procedures.	
3.1.8	Testing of new and old installation and identification of live and neutral conductors.	
3.2	Shop practice	18
3.2.1	Making of a bore conductor joint and soldering of the same	
3.2.2	Wiring with single core P.V.C. Cable.	
3.2.3	Wiring of Twin Core Cable through main switch, pouser plug points etc.	
3.2.4	Testing of the installation of small workshop wiring/house wiring with some faults	
4.0	TEST AND VIVA-VOCE	2

*Total Hrs*      **75**

**REFERENCE BOOKS:**

1. P. L. Jain.: *Principles of Foundry Technology* - Tata McGraw Hill Publishing Company Limited
2. Serope Kalpakjian: *Manufacturing Engineering and Technology* - Addison Wesley Publishing Company.
3. P. N. Rao: *Manufacturing Technology: Foundry, Forming and Welding* - Tata McGraw Hill Publishing Company Limited.

4. R. S. Khurmi Gupta & J. K. Gupta: *A Textbook of Workshop Technology (Manufacturing Process)* – S. Chand & Company Limited.
5. P. Kannaiah & K. L. Narayana: *Workshop Manual* – Scitech Publications (India) Pvt. Ltd.
6. S.K. Hajra Choudhury: *Workshop Technology Vol 1 &2* - Media Promoters of Publishers
7. O.P. Khanna: *Workshop Technology* - Dhanpat Rai & Sons Publications
8. Chapman *Workshop Technology Parts 1 & 2, 4th Edition* - Viva Books P. Ltd., New Delhi
9. Kenyon Pitman *Basic Fabrication & Welding* - Pitman Pub. Ltd.

## PROFESSIONAL PRACTICES – II

L        T        P  
0        0        2

Curri. Ref. No: ME 510

Total Contact hrs.: 30

Total marks: 50

Practical:

Theory : 0

P.A : 50

Practical: 30

Credit: 1

### RATIONAL :

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

### AIM

Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

### Contents

#### Activities

#### Industrial Visits

Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work.

**TWO** industrial visits may be arranged in the following areas / industries:

- i. Manufacturing organizations for observing various manufacturing processes including heat treatment
- ii. Material testing laboratories in industries or reputed organizations
- iii. Auto workshop / Garage
- iv. Plastic material processing unit
- v. ST workshop / City transport workshop

Lectures by Professional / Industrial Expert be organized from **ANY THREE** of the following areas:

- i. Use of a plastics in automobiles.
- ii. Nonferrous Metals and alloys for engineering applications
- iii. Surface Treatment Processes like electroplating, powder coating etc.
- iv. Selection of electric motors.
- v. Computer aided drafting.
- vi. Industrial hygiene.
- vii. Composite Materials.
- viii. Heat treatment processes.
- ix. Ceramics
- x. Safety Engineering and Waste elimination

**Individual Assignments:**

**Any two** from the list suggested

- a) Process sequence of any two machine components.
- b) Write material specifications for any two composite jobs.
- c) Collection of samples of different plastic material or cutting tools with properties, specifications and applications.
- d) Preparing models using development of surfaces.
- e) Assignments on bending moment, sheer forces, deflection of beams and torsion chapters of strength of material.
- f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.
- g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.
- h) List the various properties and applications of following materials - a. Ceramics b. fiber reinforcement plastics c. thermo plastic plastics d. thermo setting plastics e. rubbers.

OR

Conduct **ANY ONE** of the following activities through active participation of students and write report

- i. Rally for energy conservation / tree plantation.
- ii. Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.
- iii. Conduct aptitude , general knowledge test , IQ test
- iv. Arrange **any one** training in the following areas :
  - a) Yoga. B) Use of firefighting equipment and First aid



Maintenance of Domestic appliances.

**Modular courses (Optional):**

A course module should be designed in the following areas for max. 12 hrs. Batch size - min. 15 students.

Course may be organized internally or with the help of external organizations.

- a) Forging Technology.
- b) CAD-CAM related software.
- c) Welding techniques.
- d) Personality development.
- e) Entrepreneurship development.

**3-D Design using software**

Computer screen, coordinate system and planes, definition of HP,VP, reference planes How to create them in 2<sup>nd</sup>/3<sup>rd</sup> environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line, circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet, Curves, Constraints fit tangency, perpendicularity, dimensioning Line convention, material conventions and lettering.

The Student should draw - different orthographic Views (including sections), Auxiliary views according to first/ Third angle method of projection. (Minimum two sheets, each containing two problems) after learning the contents as above.

## **TERM -IV**

## ENGINEERING ECONOMICS AND ACCOUNTANCY

L        T        P  
3        0        0

**Curri. Ref. No.: G303**

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial: 0

P.A.: 25

Practical: 0

**Credit: 3**

### RATIONALE

The knowledge of Engineering Economics and Accountancy is needed by personnel dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers / Technicians, in general, need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprise.

This particular subjects deals in basic concepts of economics, production of commodities, different types of industries, market forms, objective of economic planning, concept of value of money, causes of unemployment, industrial policy, business transaction and accountancy, maintenance of cash and balances, receipt and expenditures and final accounts.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
<b>1.0 INTRODUCTION</b>	<b>1</b>
1.1 Introduction to Economics and its Utility of study	
1.2 Importance of the study of Economics	
<b>2.0 BASIC CONCEPTS OF ECONOMICS</b>	<b>3</b>
2.1 Definition of Utility, Consumption, Want, Value, Price, Goods, National Income.	

2.2	Classification of goods, characteristics and classification of wealth.	
2.3	Basic Laws of demand and supply.	
2.4	Concept and Measurement of Elasticity of demand	
<b>3.0</b>	<b>PRODUCTION</b>	<b>3</b>
3.1	Meaning and factors of production.	
3.2	Land, Labour, Capital and Organisation	
3.3	Formation of Capital, Break even chart-its uses.	
<b>4.0</b>	<b>SCALE OF INDUSTRIES</b>	<b>2</b>
4.1	Definition, advantages and disadvantages of small, medium and large scale production	
4.2	Internal and External Economies	
<b>5.0</b>	<b>MARKET FORMS</b>	<b>3</b>
5.1	Definition and types of Markets in respect of present trends.	
5.2	Features of Perfect, Imperfect and monopoly markets.	
5.3	Price determination under perfect competition and monopoly	
<b>6.0</b>	<b>ECONOMIC PLANNING</b>	<b>3</b>
6.1	Features of Under-developed and Developing Countries.	
6.2	Meaning, objectives and needs of planning.	

6.3	Introduction to industrial development in India during the five year plans.	
<b>7.0</b>	<b>MONEY</b>	<b>3</b>
7.1	Meaning and functions of Money	
7.2	Introduction to the concept of the value of money	
7.3	Meaning of Inflation, Deflation, Stagnation.	
<b>8.0</b>	<b>UNEMPLOYMENT</b>	<b>2</b>
8.1	Meaning, types and causes of Unemployment	
8.2	Unemployment problems in India	
<b>9.0</b>	<b>INDUSTRIAL POLICY</b>	<b>3</b>
9.1	Current Industrial Policy	
9.2	Industrial licensing Policy, De-licensing	
9.3	Monopolistic and Restricted Trade practices (MRTP) Foreign Exchange Regulation Act (FERA).	
<b>10.0</b>	<b>BUSINESS TRANSACTIONS AND ACCOUNTANCY</b>	<b>5</b>
10.1	Transactions and classifications, need and objectives of proper records including double entry system.	
10.2	Classification of Accounts and its description (in respect of real accounts, personal accounts and nominal accounts)	
10.3	Debit and credit concept; golden rules of debit and credit.	

10.4 Objectives and principles of double entry book-keeping.

**11.0 BOOKS OF ACCOUNTS 2**

11.1 Journal and Ledger, their sub-divisions; posting from journals to ledger.

11.2 Balancing of Accounts

**12.0 CASH BOOK 2**

12.1 Objective of Cash Book (in respect of all kinds of Cash transactions)

12.2 Single column, double column and triple column cash book

12.3 Imprest system of Petty Cash Book.

**13.0 TRIAL BALANCE 2**

13.1 Objective, Preparation, errors and rectification (in respect of balance of accounts for the total period).

**14.0 FINAL ACCOUNTS 5**

14.1 Steps of preparing accounts; Trading Account; Profit and Loss Account

14.2 Revenue and Depreciation adjustment

14.2 Introduction to balance sheet

<b>15.0</b>	<b>CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION</b>	<b>3</b>
15.1	Receipts and payments	
15.2	Income and Expenditure differences	
<b>16.0</b>	<b>MEANING AND PURPOSE OF COSTING</b>	<b>2</b>
16.1	Elements of Cost-Analysis and classification of expenditure for cost accounts.	
16.2	Cost Control – Prime cost, Overhead cost, and Indirect materials and tools.	
<b>17.0</b>	<b>ELECTRONICS COMMERCE – MEANING – SCOPE</b>	<b>1</b>
17.1	Accounting Software – Tally latest version	

**SUGGESTED LEARNING RESOURCES:**

**Reference Books :**

1. Agrawal, A.N., Indian Economy, New Delhi ; wish Prahashan, 2005
2. Wali, B.M., and A.B. Kalkundrikar – Managerial Economics, New Delhi : **R.Chand and Co., 1983**

L        T        P  
3        0        0

Curri. Ref. No.: G304

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial :0

P.A.: 25

Practical: 0

Credit: 3

## **RATIONALE**

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment and culminating in economic development of the country. It deals with basic issues like entrepreneurial characteristics and quality, governmental policy support and overall scenario along with opportunities and the facilities available for entrepreneurship development.

## **DETAIL COURSE CONTENT**

### **THEORY:**

<b>UNIT TOPIC / SUB-TOPIC</b>	<b>Lecture Hrs.</b>
<b>1.0 INTRODUCTION</b>	<b>10</b>
1.1 Definition and functions of Entrepreneur, entrepreneurship quality, entrepreneurial spirit, need for entrepreneurship.	
1.2 Individual and social aspects of business – achievement motivation theory	
1.3 Social responsibilities of Entrepreneurs	
<b>2.0 FORMS OF BUSINESS ORGANISATION</b>	<b>4</b>
2.1 Types of company	
2.2 Merits and demerits of different types	
2.2 Registration of small scale industries	
2.4 Conglomeration.	
<b>3.0 SMALL SCALE AND ANCILLARY INDUSTRIES</b>	<b>8</b>



3.1	Definition – scope with special reference to self employment.	
3.2	Procedure to start small scale and Ancillary industries	
3.3	Pattern on which the Scheme/Project may be prepared	
3.4	Sources of finance - Bank, govt., and other financial institutions.	
3.5	Selection of site for factory	
3.6	Factors of selection	
3.7	N.O.C. from different authorities, e.g., Pollution Control Board, Factories Directorate etc.	
3.8	Trade License.	
<b>4.0</b>	<b>SYSTEM OF DISTRIBUTION</b>	<b>1</b>
4.1	Wholesale Trade	
4.2	Retail trade	
<b>5.0</b>	<b>SALES ORGANISATION</b>	<b>3</b>
5.1	Market survey, marketing trends, knowledge of competitors, product selection & its basis .	
5.2	Sales promotion	
5.3	Advertisement	
5.4	Public relations and selling skills	
<b>6.0</b>	<b>PRICING THE PRODUCT</b>	<b>1</b>
6.1	Basic guidelines	
<b>7.0</b>	<b>INTRODUCTION TO IMPORT AND EXPORT</b>	<b>6</b>
7.1	Procedures for export	
7.2	Procedures for import	
7.3	Technical collaboration – international trade	
7.4	Business insurance	
7.5	Rail and road transport	
7.6	Forwarding formalities, FOR, FOB, CIF, etc.	
<b>8.0</b>	<b>BUSINESS ENQUIRIES</b>	<b>4</b>
8.1	Enquiries: From SISI, DIC, SFC Dept. of Industrial	

- Development Banks.
- 8.2 Offers and Quotations
- 8.3 Orders

**9.0 PROJECT REPORT 6**

- 9.1 Project Report on feasibility studies for small scale industries, proposal for finances from bank and other financial institutions for establishing new industries and its extension, obtaining License enlistment as suppliers, different vetting organizations for Techno Economic feasibility report.  
Breakeven analysis, Breakeven point.

**10.0 ENVIRONMENT LEGISLATION 2**

- 10.1 Air Pollution Act
- 10.2 Water Pollution Act
- 10.3 Smoke Nuisance Control Act
- 10.4 ISO: 14000, OSHA

**SUGGESTED LEARNING RESOURCES:**

**Reference Books:**

1. Entrepreneurship Development  
Prepared by CTSC Manila Publishers by Tata Mc Graw Hill Publishing Co. Ltd.
2. Small Enterprise Management Published by ISTE, Mysore
3. Motivation Published by ISTE, Mysore
4. S.S.M. in Environmental Engineering Published by ISTE, Mysore
5. Entrepreneurship New Venture Creations, Holt, Prentice Hall, India.
6. Essence of TQM by John Bank

7. Rathore, B.S. and J.S. Saini(ed), A Handbook of Entrepreneurship – Panchkula : Aapga, 1997
8. Jose Pauletal, Entrepreneurship Development, Mumbai : Himalaya Publishing House, 1996
9. Khanka, S.S., Entrepreneurship Development, New Delhi : S. Chand and Co., 2001
10. Nagarazan, R.S. and A.A. Arivalagar, TQM New Delhi : New Age International Publishers, 2005
11. Bhatia, R.C., Marketing Communication and Advertising, New Delhi : Galgotia Publishing Co., 2003
12. Sinha, J.C., and V.N. Mugali : A Textbook of Commerce, New Delhi : R. Chand and Co., 1994

## PRINCIPLES OF MANAGEMENT

L        T        P  
3        0        0

Curri. Ref. No. G305

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial :0

P.A.: 25

Practical : 0

**Credit: 3**

### RATIONALE

Management is the integrated component of all areas of technological courses as recognized across the world. Technicians or supervisors coming out of the system hence need to study the basics components of the management relevant to them. Principles of management will enable them to apply basic knowledge of management in their field of work. Keeping with this in mind necessary content details of the course on Principles of Management has been developed. With the assumption that, it will develop some management foundation to the diploma students.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
<b>FRAMEWORK OF MANAGEMENT</b>	<b>8</b>
1.1 Nature of management	
1.2 Development of management thoughts	
1.3 Management and process skills	
<b>2.0 PLANNING</b>	<b>9</b>
2.1 Fundamentals of planning	

2.2 Planning premises and forecasting

2.3 Decision making

2.4 Mission and objective

### **3.0 ORGANIZING**

**10**

3.1 Fundamentals of organizing

3.2 Design of organization structure

3.3 Forms of organization structure

3.4 Power and authority

3.5 Authority relationship

### **4.0 STAFFING**

**8**

4.1 Fundamentals of staffing

4.2 HR planning

4.3 Recruitment and selection

4.4 Training and development

4.5 Performance appraisal

### **5.0 DIRECTING**

**6**

5.1 Fundamentals of directing

5.2 Operational control techniques

5.3 Overall control technique

## **6.0 TOTAL QUALITY MANAGEMENT**

4

6.1 Concepts and definitions

6.2 Sages of quality gurus and their contributions

6.3 Basic tools of TQM

### **SUGGESTED LEARNING RESOURCES:**

Reference books:

1. Principles of management, by: T.Ramasamy (Himalya publishing house)
2. Management by: S. P. Robins
3. Management principles by: Anil Bhat and Arya Kumar
4. Principles and practice of management by LM Prasad
5. Principles of management by LM Prasad
6. Essentials of Management / Joseph L. Massie / Prentice-Hall of India

## ORGANIZATIONAL BEHAVIOUR

L        T        P  
3        0        0

Curri. Ref. No.:G306

**Total Contact hrs.:**

Theory: 45

Tutorial :0

Practical: 0

**Credit: 3**

**Total marks: 100**

**Theory:**

End Term Exam: 75

P.A.: 25

### RATIONALE

Knowledge in behavioural principles in an organization is an important requirement because concepts such as work motivation, behavioural patterns of individuals as also those of group of individuals etc are intimately related to it. Organizational Behavioural principles, its scopes, applicability etc. are therefore important to know by the students irrespective of the branch of specialization. Based of the above facts following content details of the subject on Organizational Behaviour has been suggested.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
<b>1.0 ORGANIZATION:</b>	<b>8</b>
Concept and Definition	
Structures (line, staff, functional divisional, matrix)	
<b>2.0 MOTIVATION :</b>	<b>10</b>
Principles of Motivation	
Aspects of Motivation	

Job motivation

Theories of motivation (Maslow, Herzberg, Theory of X&Y of Mc. Gregar)

**3.0 DEVELOPING GOOD WORK HABITS: 10**

Principles of habit formation

Attitude and values

Personality-

- Concepts

- Theories

- Personality and Behaviour

**4.0 ORGANIZATIONAL CULTURE: 8**

Concepts and its importance

Determinants of organizational culture

Rules & regulations

**5.0 TEAM BUILDING: 9**

Concepts

Team and Group

Formation of Team building

**SUGGESTED LEARNING RESOURCES:**

**Reference Books:**



1. Organisational Behaviour — An introductory Text – Huezyski A. & Bucheman C. (Prentice Hall of India)
2. Image of Organisation — Morgan G. (Sage)
3. Understanding Management — Linstoand S. (Sage)
4. Organizational Behaviour — Robbins (Prentice Hall of India)
5. Understanding and Managing – Organizational Behavior — George & Jones
6. Organisational Behaviour, L.M. PRASAD, New Delhi, Sultan Chand & Sons
7. Essentials of Management — Koontz (Tata McGraw Hill)

## ENVIRONMENTAL EDUCATION

L            T            P  
3            0            0

Curri. Ref. No. G307

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial : 0

P.A.: 25

Practical : 0

**Credit: 3**

### RATIONALE

Management of Environmental Degradation as also its control using innovative technologies is of prime importance in the times we are living in. Since the days of the famed Rio Summit (1992) awareness about degradation of environment we live in an its management through participation of one and all has literally blossomed into a full fledged movement of universal importance. Technically qualified people, such as the Diploma Engineers, should not only be aware about new technologies to combat environmental degradation at their disposal but also various aspects of environment, ecology, bio-diversity, management, and legislation so that they can perform their jobs with a wider perspective and informed citizens. This course can be taken by all diploma students irrespective of their specializations.

### DETAILED COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
<b>1.0 INTRODUCTION</b>	<b>2</b>
1.1 Introduction	
1.2 Environment and its components	
1.3 Environment in India	
1.4 Public Awareness	
<b>2.0 ECOLOGICAL ASPECTS OF ENVIRONMENT</b>	<b>8</b>
2.1 Ecology	
• Eco-system	
• Factors affecting Eco-system	

## 2.2 Bio-geochemical cycles

- Hydrological cycle
- Carbon cycle
- Oxygen cycle
- Nitrogen cycle
- Phosphorous cycle
- Sulphur cycle

## 2.3 Bio-diversity

## 2.4 Bio-diversity Index

# **3.0 NATURAL RESOURCES 5**

## 3.1 Definition of Natural Resources

## 3.2 Types of Natural Resources

## 3.3 Quality of life

## 3.4 Population & Environment

## 3.5 Water Resources

- Sources of Water

## 3.6 Water Demand

## 3.7 Forest as Natural Resource

- Forest and Environment
- Deforestation
- Afforestation
- Forest Conservation, its methods

## 3.8 Land

- Uses and abuses of waste and wet land

# **4.0 GLOBAL ENVIRONMENTAL ISSUES 9**

## 4.1 Introduction

## 4.2 Major Global Environmental Problems

## 4.3 Acid Rain

- Effects of Acid Rain

## 4.4 Depletion of Ozone Layer

- Effects of Ozone Layer Depletion

## 4.5 Measures against Global Warming

## 4.6 Green House Effect

<b>5.0</b>	<b>ENVIRONMENTAL POLLUTION</b>	<b>9</b>
	5.1 Introduction	
	5.2 Water Pollution	
	<ul style="list-style-type: none"> <li>• Characteristics of domestic waste water</li> <li>• Principles of water treatment</li> <li>• Water treatment plant (for few industries only- unit operations &amp; unit processes - names only)</li> </ul>	
	5.3 Air Pollution	
	<ul style="list-style-type: none"> <li>• Types of air pollutants</li> <li>• Sources of Air Pollution</li> <li>• Effects of Air Pollutants</li> </ul>	
	5.4 Noise Pollution	
	<ul style="list-style-type: none"> <li>• Places of noise pollution</li> <li>• Effect of noise pollution</li> </ul>	
<b>6.0</b>	<b>CLEAN TECHNOLOGY</b>	<b>6</b>
	6.1 Introduction to Clean Technologies	
	6.2 Types of Energy Sources	
	<ul style="list-style-type: none"> <li>• Conventional Energy sources</li> <li>• Non-conventional sources of Energy</li> </ul>	
	6.3 Types of Pesticides	
	6.4 Integrated Pest Management	
<b>7.0</b>	<b>ENVIRONMENTAL LEGISLATION</b>	<b>3</b>
	7.1 Introduction to Environmental Legislation	
	7.2 Introduction to Environmental Laws	
<b>8.0</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT</b>	<b>3</b>
	8.1 Introduction to Environmental Impact Assessment	
	8.2 Environmental Management (elements of ISO 14001)	
	8.3 Environmental ethics	

SUGGESTED IMPLEMENTATION STRATEGIES:

The teachers are expected to teach the students as per the prescribed subject content. This subject does not have any practical but will have only demonstration and field visit as stated. The students will have to prepare report of the site visit.

### SUGGESTED LEARNING RESOURCES:

(a) Reference Books:

S. No.	Title	Author, Publisher, Edition & Year
1.	Environmental Engineering	Pandya & Carny, Tata McGraw Hill, New Delhi
2.	Introduction to Environmental Engineering and Science	Gilbert M. Masters Tata McGraw Hill, New Delhi
3.	Waste Water Engineering – Treatment, Disposal & Reuse	Metcalf & Eddy Tata McGraw Hill, New Delhi
4.	Environmental Engineering	Peavy, TMH International New York
5.	Study / training materials, references, reports etc. developed by Central Pollution Control Board, New Delhi as also State Pollution Control Boards	Central Pollution Control Board Postal Address: Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA Tel.: 91-11-22307233 Fax: 91-11-22304948 e-mail: ccb.cpcb@nic.in
6.	Environmental Science	Aluwalia & Malhotra, Ane Books Pvt. Ltd, New Delhi
7.	Text Book of Environment & Ecology	Sing, Sing & Malaviya, Acme Learning, New Delhi
8.	Environmental Science & Ethics	Sing, Malaviya & Sing, Acme Learning, New Delhi
9.	Environmental Chemistry	Samir K. Banerji, Prentice Hall of India, New Delhi

(b) Others:

1. Text book mentioned in the references
2. Lab Manuals
3. OHP Transparencies
4. Video film on Environment

## **SUGGESTED LIST OF DEMONSTRATIONS/FIELD VISIT**

- pH value of water sample.
- Hardness of water
- Calcium hardness
- Total Hardness
- Residual Chlorine to a given sample of water
- Turbidity
- B.O.D.
- C.O.D.

**Visits: Following visits shall be arranged by the teachers during the semester:**

- Water Treatment Plant
- Sewage Treatment Plant
- Maintenance work of water supply mains and sewage system

**COURSE TITLE : MANUFACTURING PROCESS-II**

L T P

Curri Ref no: ME 402

3 1 0

**Total Contact hrs.:60**

**Total marks:100**

**Theory**

Lecture: 45

End Term: 75

Tutorial:15

P.A: 25

Practical: 0

**Practical:**

End Term: 00

P.A: 00

**Pre-requisite: ME-401**

**Credit :4**

**DETAILED COURSE CONTENTS  
THEORY**

<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
<b>Chapter-1.0 Lathe Operations</b>	<b>12</b>
1.1 Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC lathe.	
1.2 Specifications.	
1.3 Basic parts and their functions	
1.4 Operations and tools – Turning, parting off, Knurling, Facing, Boring, drilling, threading, step turning, taper turning.	
<b>Chapter-2.0 Drilling</b>	<b>9</b>
2.1 Classification.	
2.2 Basic parts and their functions - Radial drilling machine.	
2.3 Types of operations.	
2.4 Specifications of drilling machine.	
2.5 Types of drills and reamers	
<b>Chapter-3.0 Milling</b>	<b>13</b>
3.1 Classification.	
3.2 Basic parts and their functions – column and knee type.	
3.3 Types of operations	
3.4 Types of milling cutters.	
3.5 Accessories & Attachments	

3.6 Milling operation. Method of feeding work piece. Indexing. ( Simple, Compound & Differential )

3.7 Helical and cam Milling machine.

**Chapter-4.0 Welding 13**

4.1 Classification.

4.2 Gas welding techniques.

4.3 Types of welding flames.

4.4 Arc Welding – Principle, Equipment, Applications

4.5 Shielded metal arc welding.

4.6 Submerged arc welding.

4.7 TIG / MIG welding.

4.8 Resistance welding - Spot welding, Seam welding, Projection welding

4.9 Welding defects.

4.10 Brazing and soldering: Types, Principles, Applications

**Chapter-5.0 Heat Treatment 8**

Process, Output Quality & Relevant Examples from manufacturing industry related to:

5.1 Stress relieving

5.2 Carburising

5.3 Case Hardening & Tempering

5.4 Annealing & Normalizing

5.5 Surface Treatments

5.6 Shot blasting

**Chapter – 6.0. Plastics and their processing 5**

6.1. Plastics: Introduction and Classification

6.2. Plastic Processing, Moulding, laminating and formed plastics

**Suggested Learning Resources**

(a) Reference Books

<b>S. No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
1.	Elements of workshop Technology – Volume I & II	<b>S.K. Hajra Chaudary, Bose, Roy Media Promoters and Publishers Ltd</b>
2.	Processes and design for manufacturing Technology – Volume-II & II	<b>D.L. Wakya Prentice Hall</b>
3.	Production Technology Volume I & II	<b>O.P. Khanna &amp; Lal Prentice Hall</b>
4.	Workshop Technology Volume I & II	<b>W.S.J. Chapman Prentice Hall</b>
5.	Introduction to Manufacturing	<b>Jhon A Schey</b>



<b>S. No.</b>	<b>Title</b>	<b>Author, Publisher, Edition &amp; Year</b>
	Process	<b>McGraw Hills International</b>
6.	Manufacturing Technology	<b>M. Aduthan and A. B. Gupta New Age International</b>

## COURSE TITLE : THEORY OF MACHINES

L T P  
3 1 0

Curri Ref no: ME 407

**Total Contact hrs.:60**

**Total marks:100**

**Theory**

Lecture: 45

End Term: 75

Tutorial: 15

P.A: 25

Practical: 00

**Practical:**

End Term: 0 P.A: 0

**Pre-requisite: G206A**

**Credit :4**

### Rationale

In automobiles, the chemical energy of the fuel is converted into mechanical energy in the engine from the sliding motion of the piston to the rotary motion of crankshaft. From crankshaft to the wheels the motion is transmitted through a series of mechanisms. Besides this power transmission, the automobile is operated with the help of several mechanisms, like steering, brake, clutch and Accelerator mechanisms. These mechanisms are prepared with the help of linkages, gears, belt drives, etc. As a technician, one should have the necessary knowledge and skills about these mechanisms for manufacturing, operation and mechanisms of automobiles. This subject deals with different kinds of mechanisms and their applications.

## DETAILED COURSE CONTENTS THEORY

UNIT TOPIC/ SUB-TOPIC	Lecture HRS
<i>Chapter 1.0 Fundamentals</i>	5
1.1 Definitions of statics, kinetics, kinematics & dynamics	
1.2 Kinematics links & their types	
1.3 Kinematics pairs & their types	
1.4 Kinematics chains & their types	
1.5 Constrained motions & their types	
1.6 Mechanisms, Inversions, Machines, Structures	

<b>Chapter 2.0 Types of Mechanisms</b>	<b>8</b>
2.1 Laws of inversions	
2.2 Single slider crank chain & its inversions like Hand pump mechanism, Oscillating cylinder engine mechanism, Quick return mechanism, Rotary I.C. engine mechanism.	
2.4 Double slider crank chain mechanism & its inversions like Scotch yoke mechanism, Oldham's coupling, Elliptical trammel	
2.6 Four bar chain mechanism & its inversions like Coupling of locomotives, Watt's indicator mechanism, pantograph	
<b>Chapter 3.0 Common Mechanisms</b>	<b>7</b>
3.1 Bicycle rear wheel sprocket mechanism	
3.2 Mechanism of two stroke I.C. Engine	
3.3 Reciprocating air compressor mechanism	
3.4 Crane mechanism (winch) with worm & worm gear box, spur gear box, with brakes.	
3.5 Steering mechanism of automobiles	
3.6 Shaper quick return mechanism	
<b>Chapter 4.0 Velocity &amp; Acceleration in Mechanisms</b>	<b>8</b>
4.1 Concept of the velocity diagram of the mechanisms by relative velocity method.	
4.2 Concept of forces acting on mechanisms & Mechanical advantage.	
4.3 Concept of centripetal & tangential Acceleration.	
4.4 Acceleration diagrams of Four bar & Slider crank mechanisms.	
4.5 Analytical method for Velocity & Acceleration.	
4.6 Klein's & Modified construction for Velocity & Acceleration	
<b>Chapter 5.0 Cams &amp; Followers</b>	<b>8</b>
5.1 <i>Concept &amp; definitions of cams &amp; followers.</i>	
5.2 <i>Types &amp; classifications of cams &amp; followers</i>	
5.3 Different follower motions, their displacements like uniform velocity, SHM, Uniform acceleration & retardation.	
5.4 Drawing of profiles of plate cams by graphical method	

## **Chapter 6.0 Power Transmission Devices**

**8**

*6.1 Belts & belt drives, types of belts , belt material, velocity ratio of belt drive, Slip & creep.*

*6.2 Determination of tension ratio in belt drives, lengths of belts, Power transmission. Initial tension , centrifugal tension ,condition for maximum power transmission with simple numerical on above topic.*

*6.3 Rope drives- Their types , advantages, limitations, applications.*

*6.4 Chain drives- Elements & composition of chain drives, their comparison with other drives, characteristics of chain drive.*

*6.5 Gears & Gear trains- Concept of friction wheel applications, Basic gear terminology of gear, types of gears & its applications, laws of gearing, gear trains & their types.*

## **Chapter 7.0 Brakes & Dynamometers**

**8**

*7.1 Functions of brakes, types of brakes, block brakes, band brake, Combined block & band brakes,*

*7.2. Expression of braking torque & braking force in each case, Internal expanding brake, hydraulically operated , pneumatically operated, Vacuum brakes.*

*7.3 Concepts, principles & working of dynamometers such as Prony brakes & Rope brake- dynamometers, Eddy current dynamometers, transmission*

*7.4 Types such as belt & torsion- dynamometers, Hydraulic dynamometer.*

## **Chapter 8.0 Friction & Clutches**

**8**

*8.1 Types of friction, laws of friction , uses of friction.*

*8.2 Types of bearings, simple Pivot & collar bearing, Conical pivot Bearing*

*8.3 Expression for torque & power by uniform pressure & wear theory with simple numericals.*

*8.4 Single & multiple plate clutches, Expression for torque & power transmitted uniform pressure & wear theory with simple numericals, practical applications of single & multiple plate clutches in Automobiles & machines.*

*8.5 Centrifugal & Diaphragm clutches, comparisons.*

## **Suggested Learning Resources**

### **(a) References Books**

<b>Sr. No.</b>	<b>Title</b>	<b>Edition</b>	<b>Author/ Publisher</b>
1 Publishers	Theory Of Machines	Latest	P.L.Ballaney/Khanna
2	Theory Of Machines	Latest	J.E. Shigley/Mcgraw Hill
3	Theory Of Machines	Latest	Timo-Shenko/Wily- Eastern
4	Theory Of Machines	Latest	Bevan T./C.B.S. Publishers
5	Theory Of Machines	Latest	Khurmi-Gupta/Eurasia Home
6 Eastwest	Theory Of Machines	Latest	Ghosh-Malik/Affiliated Press.
7	Theory Of Machines	Latest	Jagadishlal

## COURSE TITLE : WORKSHOP PRACTICE - IV

L    T    P  
1    0    4

Curri. Ref. No: ME 410

Total Contact hrs.: 75      Total marks: 100

Theory: 15

Theory:

End Term Exam: 0

Practical: 60

Practical:

Prerequisite: G203,

End Term Exam: 50

G204, ME 409

P.A: 50

Credit: 3

### RATIONALE :

The wealth of a community is measured by the variety and quality of the articles it possesses for its use and consumption. All the materials we possess are made from substances won from the earth, or from nature. Our property depends upon our ability to convert these raw materials into useful articles for consumption, and to distribute these articles equitably amongst the various members of our community. The production of our engineering workshops is important since a large proportion of our industries is of an engineering nature. Our ability, therefore, to maintain a high standard of skill in our engineering workshops is an important factor.

### Aim

To use and describe the tools, materials and working principles of various processes for pattern making shops, foundry shops, and electric shops.

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
<b>1.0</b>	<b>MACHINE SHOP</b>	<b>10</b>
	1.1 Shop Talk	
	1.1.1 Introduction to Machine Shop: Role of machine shop and its importance in Manufacturing, difference between machine and machine tool, discussion on different types of machine.	
	1.1.2 Safety precautions to be observed in machine shop: Safety measures in construction work, Protection in storage and manual handling of material, causes and common sources of accident, common precautions against electric shocks, damages and fires etc.	

- 1.1.3 Study of a centre lathe: Types of lathe, parts of the lathe, lathe accessories lathe lurning, thread cutting, specifications of a lathe, running and routine maintenance of a centre lathe.
- 1.1.4 Study of a single point cutting tool: Classification of cutting tool, materials of cutting tool, various angles of cutting tool, nomenclature of cutting tool.
- 1.1.5 Study of planner, shaper and slotter: Functions of planning machine, Planner tools, cutting speed feed and depth of cut, Functions of shaper, Shaper tools, cutting speeds and speeds. Functions of a slotting machine, Slotter tools, cutting speed, feed and depth of cut.
- 1.1.6 Demonstration of job and test setting on a shaper, planner and slotter.
- 1.1.7 Adjustment of stroke length and study of quick return, mechanism of a shaper and planner.
- 1.1.8 Study of Capstan and Turret: Introduction to semi-automatic lathe, functions of capstan and turret lathe.
- 1.1.9 Study of a CNC Lathe
- 1.2 Machine Shop Practice 30
  - 1.2.1 Tool grinding practice on M. S. square bar
  - 1.2.2 Job setting for centering, facing and counter boring on a 3-jaw and a 4-jaw chuck
  - 1.2.3 Practical on plain turning, step turning and taper turning process using 4-jaw chuck and tail stock.
  - 1.2.4 Practical on knurling, chamfering, drilling and parting off operations.
  - 1.2.5 Practical on external and internal thread cutting on a capstan lathe
  - 1.2.6 Practical on Horizontal, Vertical and Angular surface and slot cutting using shaping machine.

1.3 Uses of Portable Hand machine: Portable Saw Mills

## **2.0 WELDING SHOP:**

- 2.1 Shop Talk 5
  - 2.1.1 Introduction to welding processes.

2.1.2	Gas welding processes: Oxy-acetylene welding, Relative advantages over other processes, Methods of welding, Composition of the Gas. Metal Inert Gas welding (MIG): Relative advantages over other processes stating specific applications. Methods of MIG welding, Composition of shielder & gases	
2.1.3	Arc welding processes: Types of arc welding processes, arc welding principle, Setting of various parameters for welding, Arc welding equipment, Electrode holder, welding Helmet, Safety goggles, welder's chipping hammer, Earthing clamps, Hand gloves Aprous and sleeves, wire brush.	
2.2	Welding shop practice	25
2.2.1	Leftward and Right ward welding.	
2.2.2	Buts-joints practice on M.S. sheet at horizontal Position by gas welding.	
2.2.3	Arc welding practice on M.S. flat bar, 4-6 mm thick both left and right ward for hand balancing	
2.2.4	Making a double Vee-Butt joint on M.S. flat of 6 mm thick with minimum 2 runs on each side by Arc welding.	
2.2.5	Making Tee Fillet with joint on flat position using M.S. flat of 4 mm. thick by arc welding.	
2.2.6	Making small grill or window frame etc. by Arc welding.	
3.0	TEST AND VIVA VOCE	5
	<b>Total Hrs</b>	<b>75</b>

**REFERENCE BOOKS:**

1. Machinist – Trade Practicals (1<sup>st</sup> year and 2<sup>nd</sup> year), Central Instructional Media Institute, Madras, Directorate General of Employment & Training, Ministry of Labour, Govt. of India.
2. R. S. Khurmi Gupta & J. K. Gupta: *A Textbook of Workshop Technology (Manufacturing Process)* – S. Chand & Company Limited.
3. P, Kannaiah & K. L. Narayana: *Workshop Manual* – Scitech Publications (India) Pvt. Ltd.
4. **Turner** – Trade practical (1<sup>st</sup> year and 2<sup>nd</sup> year), Central Instructional Media Institute, Madras Directorate of Employment & training, Ministry of Labour, Govt. of India.
5. S. K. Hazra Choudhury and A. K. Hazra Choudhury: **Elements of Workshop Technology Vol. I & II** - Media Promoters & Publishers Pvt. Ltd.



6. R. N. Dutta: **Machine Tools Vol. I**, - S. Charel & Company Ltd.
7. B. S. Raghu Wanshi: **A course in Workshop Technology Vol. I & II** - Dhanpat Rai & Sons.
8. O.P. Khanna: **Workshop Technology** - Dhanpat Rai & Sons Publications
9. Chapman: **Workshop Technology Parts 1 & 2, 4th Edition** - Viva Books P. Ltd., New Delhi
10. Kenyon Pitman: **Basic Fabrication & Welding** - Pitman Pub. Ltd. P.N.Rao **Manufacturing Technology** Tata Macgraw Hill

**COURSE TITLE : MACHINE TOOL TECHNOLOGY**

L T P  
3 1 0

Curri Ref no: **ME 504**

**Total Contact hrs.:60**

**Total marks:100**

**Theory**

Lecture: 45

End Term: 75

Tutorial:15

P.A: 25

Practical: 0

**Practical:**

End Term: 00

P.A: 00

**Pre-requisite: ME-401,ME402**

**Credit :4**

**DETAILED COURSE CONTENTS  
THEORY**

<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
<b>Chapter 1.0 Turning</b>	<b>6</b>
1.1 Angle calculations for taper turning.	
1.2 Cutting tool nomenclature and tool signature.	
1.3 Cutting parameters and machining time calculation.	
<b>Chapter 2.0 Finishing &amp; super finishing machines.</b>	<b>8</b>
2.1 Introduction, types of grinding machine, special grinding machines- such as tool & cutter grinder, cam and shape grinder .	
2.2 Grinding wheels designation as per IS 551-1954.	
2.3 Grinding wheel elements , Abrasive material ,wheel bond,	
2.4 Selection of grinding wheel,	
2.5 Grinding wheel dressing ,types of dresses used.	
2.6 Super finishing operations.- lapping, buffing , super finishing, polishing, power brushing tumbling, Electroplating. Etc.	
<b>Chapter 3.0 Broaching.</b>	<b>8</b>
3.1 Introduction	
3.2 Broaches, broaching operation, broaching methods.	
3.3 Broaching machines.	
3.4 Broaching fixture.	
3.5 Advantages and limitation of broaching.	

**Chapter 4.0 Non Traditional Machining**

**8**

- 4.1. Introduction
- 4.2. Classification of the machining processes.
- 4.3. Abrasive jet machining , ( AJM) ,Ultrasonic machining (USM)  
Chemical machining (CHM), Electro chemical machining ( ECM),  
Electron beam machining ( EBM ), Laser beam machining ( ( LBM),  
Electric discharger machining. (EDM), Plasma arc machining ( PAM) .

**Chapter 5.0 Computerised Numerically Control Systems.**

**12**

- 5.1. Automation in manufacturing industry. Automation in machines,  
Advantages & Disadvantages of CNC, Direct numerical control  
( DNC).
- 5.2. Classification of CNC m/c
- 5.3. Fundamental of part programming –Manual, Computer aided.
- 5.4. Method of listing Co-ordinate-Absolute, Incremental
- 5.5. Procedure for developing Programming
  - N.C. Word.
  - Programming formats..
  - G& M Codes.
  - Part programming  
for machining point to point, line ,curved surface.
- 5.6 Use of sub routines for writing part programming .
- 5.7. Use of do loops for writing, part programming.
- 5.8 Tooling for CNC Machine-- Spindle tooling for machine centers ,  
tooling for CNC turning centers, tool- presetting.Equipment, Flexible  
tooling system. ATC on CNC machines.

**Chapter 6.0 Multipoint Cutting Tools**

**10**

- 6.1 **Milling cutters** : Classification of milling cutters. Nomenclature of  
milling cutter elements .Cutting forces on milling cutters. Selection of  
cutter geometry and design of face milling cutters. Solid carbide cutters.  
Brazed tip cutters. Arbors and types of arbors Index table
- 6.2 **Drills**: Types of drills. Elements of drill point. Drill wear, Drill point  
sharpening, Chip control in drilling operation. Cutting forces. Power  
requirement for drilling .Counter boring, Spot facing, Counter sinking,  
Deep hole drilling. Gun drills nomenclature, geometry, construction, chip  
control etc.Gun bores
- 6.3 **Reamers** : Nomenclature. Classification. Elements of reamers. Cutting  
forces. Cutting conditions, Bushings and floating holders of reamers.  
Troubleshooting.

- 6.4 **Taps** :Tapping process. Nomenclature. Classification. Trouble shooting. Speeds.
- 6.5 **Broaching tools**:Basic process. Broach ability of materials. Types of broaching processes and broaches. Design of broach. Force required for broaching, Cutting speeds, Broach wear, Broach tolerances, resharpener of broaches.
- 6.6 **Gear cutting** : Types of processes, Gear hobbing, Gear shaping
- 6.7 **Thread cutting** : Thread chasing, Thread milling, Thread whirling, Thread dieing, Thread rolling,

**Chapter 7.0 Machine Tool Automation 5**

- 7.1 Introduction and Need.
- 7.2 Single spindle automates, transfer lines.
- 7.3 Elements of control system, Limit switches, Proximity switches.
- 7.4 Block diagram for feedback and servo control system.
- 7.5 Introduction to PLC, Block diagram of PLC.

**Chapter 8.0 Special Purpose Machines (SPM) 3**

- 8.1 Concept, General elements of SPM
- 8.2 Productivity improvement by SPM
- 8.3 Principles of SPM design.

**Suggested Learning Resources**

**(a) Reference Books**

Sr. No.	Title	Author, Publisher, Edition
1	Work-shop technology	Hajara chowdhari. vol.2
2	Work-shop technology	Chapman.
3	Work-shop technology	Gupta and Kaushik. vol.2
4	Work-shop technology	R. K. Jain. vol.2
5	Manufacturing process.	Young.
6	Production technology.	H.M.T., Banglore Tata Mc-Graw Hill
7	CNC machines	Pabla B.S., M. Adithan

<b>8</b>	<b>Non conventional machining</b>	<b>New Age international ltd. P.K. Mishra</b>
<b>9</b>	<b>Manufacturing Processes</b>	<b>Narvasa Publishing House Begman, Amsted John Willey and Sons</b>
<b>10</b>	<b>Fundamental of metal cutting and machine tools</b>	<b>B.L. Juneja New Age international ltd.</b>
<b>11</b>	<b>Technology of machine tools</b>	<b>Steve Krar, Albert Check Mc-Graw-Hill International</b>
<b>12</b>	<b>Manufacturing technology metal cutting &amp; machine tools</b>	<b>P.N. Rao Tata McGraw Hill</b>

**COURSE TITLE : THERMAL ENGINEERING-11**

L            T            P  
3            0            3

Curri Ref no: **ME 505**

**Total Contact hrs.:90**

**Total marks:175**

Lecture: 45

Tutorial: 0

Practical: 45

**Theory**

End Term: 75

P.A: 25

**Practical:**

End Term: 25

P.A: 50

**Pre-requisite: ME405**

**Credit :5**

**RATIONALE :**

Diploma engineers are often expected to work on the operational areas of production., maintenance, erection ,commissioning etc. While working in these areas diploma engineer always comes across various devices and equipments which works on heat energy. Such devices includes Boilers, Compressors, Turbines, etc. He is also expected to have fundamental idea about various types of Power Plants such as Thermal, Nuclear etc. Basic construction and working of these devices and systems should be understood by the diploma engineers.

**DETAILED COURSE CONTENTS**

**THEORY**

<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
<b>Chapter 1.0 Introduction</b>	<b>6</b>
1.1 Concept of Reversible and Irreversible processes,	
1.2 Entropy, Calculation Of entropy changes during various processes.	

<b>Chapter 2 .0</b>	<b>I.C. Engine &amp; Testing</b>	<b>10</b>
2.1	Various ideal thermodynamic cycles, Otto, diesel and dual cycles	
2.2	Classification of I.C. engine & working principle of 4 and 2 stroke cycle	
2.3	Indicator diagrams, valve timing diagram,	
2.4	Systems used in I.C. engines such as Fuel supply systems . Carburettors and Fuel pump & Injectors Engine Cooling Systems, Ignition systems	
2.5	Terms related to I.C. engines- scavenging, Pre-ignition , Detonation Supercharging.	
2.7	Engine power – IBP , FP & BP , Mechanical , thermal , relative , volumetric efficiencies. fuel consumption , BSFC.	
2.6	Morse and motoring test, heat balance sheet, Different fuels used for I.C.Engines & their properties.	
2.7	Concept of pollutants in exhaust gases in petrol & diesel engine such as CO, unburnt Hydro carbon ,their effect on Environment , Exhaust gas analysers for petrol & diesel engines, Central motor vehicles Act provisions 1989 Section 115 Rgulations.	
<b>Chapter 3.0</b>	<b>Air Compressor</b>	<b>7</b>
3.1	<b>Industrial use of compressed air. Classification, construction and working of single and two stage compressor.</b>	
3.2	Efficiency- volumetric, isothermal, mechanical (numericals)	
3.3	Multistaging- Advantage of multistaging. Rotary compressors like Centrifugal, Roots Blower, Vane type, Screw type. Pneumatic tools.	
<b>Chapter 4.0</b>	<b>Principles Of Refrigeration</b>	<b>8</b>
4.1	Reverse carnot cycle ,Principal of refrigeration , COP, Heat pump & Refrigeration, Units of refrigeration,	
4.2	Vapour compression cycle, its representation on P-H & T-S diagram.	
4.3	Calculation of work input, Refrigerating effect with simple numericals various types of refrigerant used ,	
4.4	Application of refrigeration, Vapor absorption cycle, Electrolux refrigerator. Calculation of COP (simple)	
4.5	Types of refrigerants and properties. Applications of Refrigeration systems.	

**Chapter 5.0 Gas Turbine**

7

- 5.1 Working cycle, classification, application of gas turbine.
- 5.2 Constant volume and constant pressure Gas turbines.
- 5.3 Principle of Turbojet, Turboprop, Ramjet Rockets, Rocket jets. Rocket fuels

**Chapter 6.0 Power Generation System**

7

- 6.1 Layout-of thermal power plant, Gas turbine power plant, Nuclear power plant.
- 6.2 Elements of Nuclear power stations ,Nuclear reactor , types of nuclear reactor such as PWR,BWR,CANDU,BLEEDING

**Suggested Learning Resources****(a) Reference Books**

S. No.	Title	Author	Publisher
1	Thermal Engineering	S.Domkundwar	S.Chand
2	Thermal Engineering	Ballaney	Dhanpatrai
3	Engg. Thermodynamics	Nag P.K.	Tata Macgraw Hill
4	Thermodynamics	Wark	Tata Macgraw Hill
5	Thermal Engineering and Heat Power	A.R.Basu	Dhanpat Rai
6	A text book of thermal Engineering	R.S. Khurmi and S.K. Kataria.	S. Chand & Co
7	A text book of thermal Engineering	R.S. Khurmi & J.K. Gupta	S. Chand & Co

**List of Experiments/Practice work (45 Hrs)**

- 1. Dismantle and assemble of a typical petrol/diesel Engine.
- 2. Study of an air compressor and observe various parts and systems.
- 3. Study of C.I. Engine and to draw the valve timing diagram and determination of power, efficiency and fuel consumption



4. Study of S.I. Engines and draw its valve setting diagram and determination of efficiency and fuel consumption
5. Study of cut section of steam engine, steam turbine, gas turbine.
6. Study of various heat exchangers such as radiators, evaporator, condenser, plate heat exchanger.
  
7. Visit to Ice Plant, Dairy, and Cold storage to study system.
8. Visit to a thermal power plant/gas turbine plant

**COURSE TITLE : FLUID MECHANICS**

L      T      P  
3      0      3

Curri Ref no: **ME 406**

- **Total Contact hrs.:90**

**Total marks:150**

**Theory**

- Lecture: 45

End Term: 75

- Tutorial: 0

P.A: 25

- Practical: 45

**Practical:**

End Term: 25

P.A: 25

- **Pre-requisite: G106,G107**

- **Credit :5**

**Rationale :**

As supervisor/ engineer, one comes across with several uses of fluids in automobiles. Such as, pressurized lubrication of engines & transmission, operation of brakes, cooling of engine, washing of vehicles with pressurized water, etc. Besides these applications, hydraulic energy is being used for doing useful work with the use of pumps, motors and cylinders. Thus, there are large numbers of applications of hydraulic fluids in automobiles. As supervisor/ engineer, one should have the necessary knowledge about the properties and behaviour of fluids, as well as various kinds of equipment based on fluids, which will be helpful in operation and maintenance of fluid system.

The curriculum is designed and developed to cater the above-mentioned needs to arrive at the course contents.

**DETAIL COURSE CONTENTS  
THEORY**

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<b>UNIT TOPIC/ SUB-TOPIC</b>	<b>Lecture HRS</b>
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**Chapter1.0 Properties Of Fluid.**

**6**

1.1 Properties of fluids : Mass density, Wt. density (sp. Wt.), Sp. Volume, Sp.

Gravity, Viscosity – kinematics, dynamic,	
1.2 Newton’s law of viscosity. Surface tension, capillarity.	
<b>Chapter 2.0 Measurement Of Pressure</b>	<b>6</b>
2.1 Absolute, Gauge, Atmospheric, vacuum pressures . Pascal’s law.	
2.2 Manometers- simple U tube, differential, single column. Gauges.	
<b>Chapter 3.0 Hydrostatics</b>	<b>6</b>
Total pressure, Center of pressure, Plane, regular surfaces immersed in liquid	
3.1 Horizontal.	
3.2 Vertical, and	
3.3 Inclined.	
<b>Chapter 4.0 Buoyancy And Floatation</b>	<b>6</b>
4.1 Center of Buoyancy, Meta-center, Meta-centric Height,	
4.2 Conditions of Equilibrium of floating and submerged bodies.	
<b>Chapter 5.0 Kinematics Of Flow</b>	<b>6</b>
5.1 Types of fluid flows and their mathematical forms.	
5.2 Rate of Flow, discharge, units of discharge. Continuity equation.	
<b>Chapter 6.0 Dynamics Of Fluid Flow</b>	<b>7</b>
6.1 Bernoulli’s equation for ideal and real fluids.	
6.2 Application of the equation in Pipes.	
6.3 Flow measurement with the help of Venturimeter, orifice meter, Pitot tube, Nozzle, notches (triangular, rectangular), and simple orifice.	
<b>Chapter 7.0 Flow Through Pipes</b>	<b>8</b>
7.1 Minor losses at exit and entry, Accessories, enlargement, reduction, bend, elbow, couplings etc.	
7.2 Major losses, Darcy’s coefficient of friction, Chezy’s constant, hydraulic gradient line, Total energy line.	
7.3 Pipes in series, Equivalent pipe, parallel pipes, branched pipes.	
7.4 Power transmission through pipes, maximum power transmission condition , maximum efficiency of transmission.	
7.5 Power transmission through nozzle, maximum power condition, diameter for maximum power transmission.	
7.6 Water hammer in pipes, basic phenomenon and precautions.	

## Suggested Learning Resources

### (a) Reference Books

Sr.No.	Title	Author/Publisher.
1.	A Text book of Hydraulics, fluid mechanics and Hydraulic machines.	Khurmi R.S./S.Chand and co ltd.
1	Hydraulics, fluid mechanics and Hydraulic machines	S. Ramamurtham./Dhanpat Rai & co.
3	Hydraulics and fluid mechanics.	Modi P.N.; Seth S.M./Standard book use.
4	Hydraulic Engineering.	Roberson J.A./Bombay Jaico.
5	A Text book of Hydraulics, fluid mechanics and Hydraulic machines.	Bansal R.K./Laxmi Publication, N.Delhi

j)

### List of Lab. Experiments/Demonstrations

(45 Hrs)

- 1 To find out mass, density of liquid
- 2 To find out weight, Density of liquid.
- 3 To find out specific Gravity of liquid.
- 4 Identify and use of different manometers in the laboratory.
- 5 Identify and draw a neat-labelled diagram of different types of gauges used in hydraulic machinery lab, and IC laboratories.
- 6 To verify the continuity equation by using branched pipes/ different set of pipes.(use velocity measuring instruments).
- 7 To measure the flow by using notch.
- 8 To measure the flow by using venturimeter, nozzle, orifice and pitot tube.

**COURSE TITLE : PROFESSIONAL PRACTICES – III**

**L**      **T**      **P**  
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Curri. Ref. No: **ME 511**

Total Contact hrs.: **30**

Total marks: **50**

**Practical:**

**Theory: 0**

**P.A : 50**

**Practical: 30**

Credit: 1

**RATIONAL:**

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

**AIM**

Student will be able to:

- Acquire information from different sources
- Prepare notes for given topic
- Present given topic in a seminar
- Interact with peers to share thoughts
- Prepare a report on industrial visit, expert lecture

**Contents**

**Activities**

**Industrial Visits**

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries: Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant.

- i. Machine shop having CNC machines.
- ii. ST workshop / Auto service station

- iii. City water supply pumping station
- iv. Manufacturing unit to observe finishing and super finishing processes.

**Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:**

Interview Techniques.

Modern Boilers - Provisions in IBR

Applications of Sensors and Transducers

Alternate fuels - CNG / LPG , Biodiesel, Ethanol, hydrogen

Piping technology

**Information Search:**

Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report **any one** topic.

Following topics are suggested:

- i. Engine lubricants & additives
- ii. Automotive gaskets and sealants
- iii. Engine coolants and additives
- iv. Two and Four wheeler carburetor.
- v. Power steering
- vi. Filters
- vii. Different drives/Transmission systems in two wheelers.
- viii. Types of bearings - applications and suppliers
- ix. Heat Exchangers
- x. Maintenance procedure for solar equipment.

Tools holder on general purpose machines and drilling machines.

**Seminar:**

Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)

Mini Project / Activities: (any one)

- a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism
- b) Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts.
- c) Make a small decorative water fountain unit.
- d) Toy making with simple operating mechanisms.

